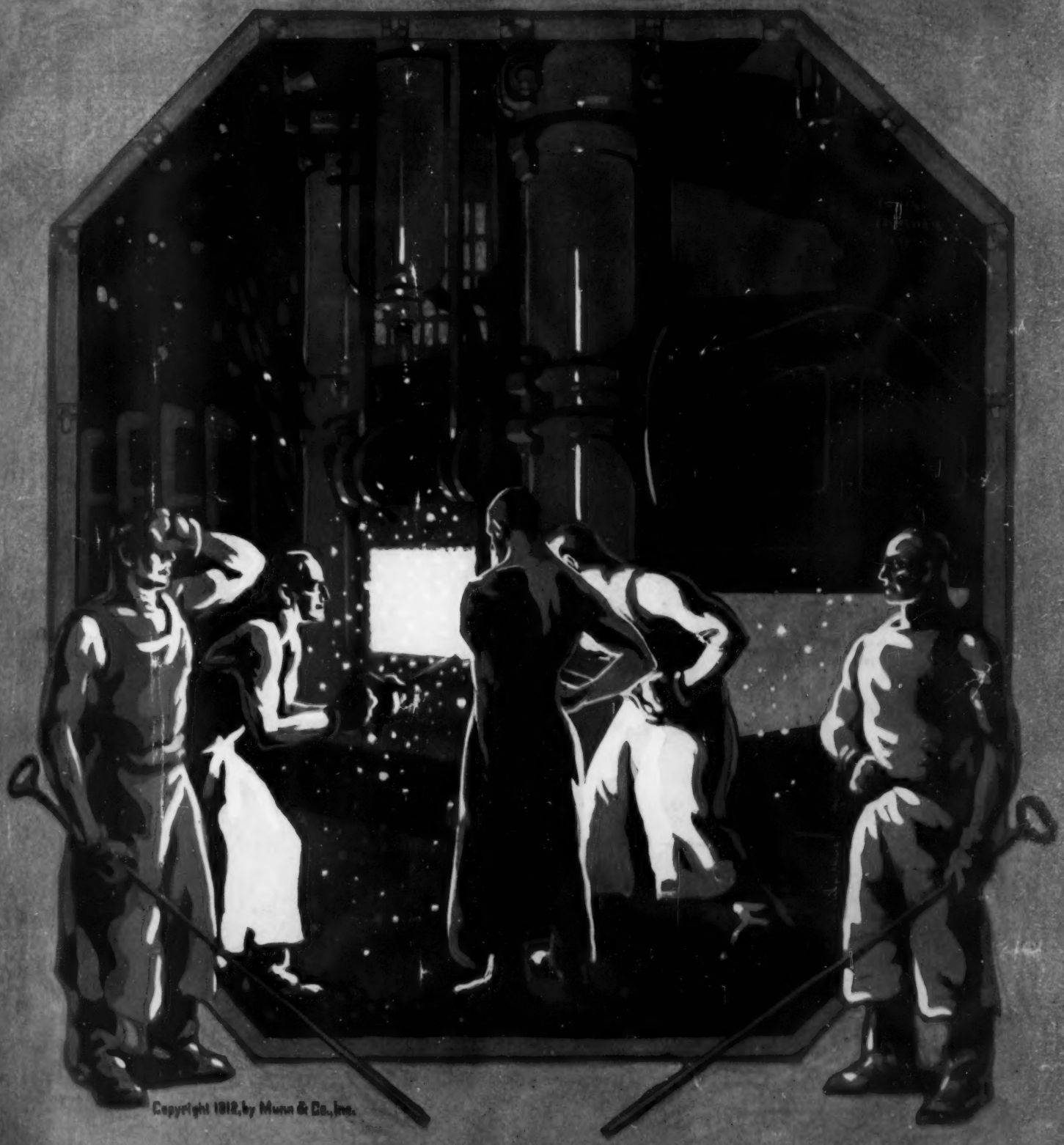
GENERAL LIBRARY
OCT 12 1912
UNIV. OF MICH.

Scientific American

October 12, 1912.



Copyright 1912, by Munn & Co., Inc.

Vol. CVII. No. 15. Munn & Co., Inc. New York, N.Y. Price 15 Cents.

$1475 **Overland 1913** $1475

Completely Equipped

F. O. B. Toledo

MODEL 71 T

Complete Electric Lighting Outfit, Generator and Storage Battery
Self-Starter
45-Horsepower
Q.D. Demountable Rims and extra Rim
Timken Bearings
Center Control
Wheel Base 114 inches

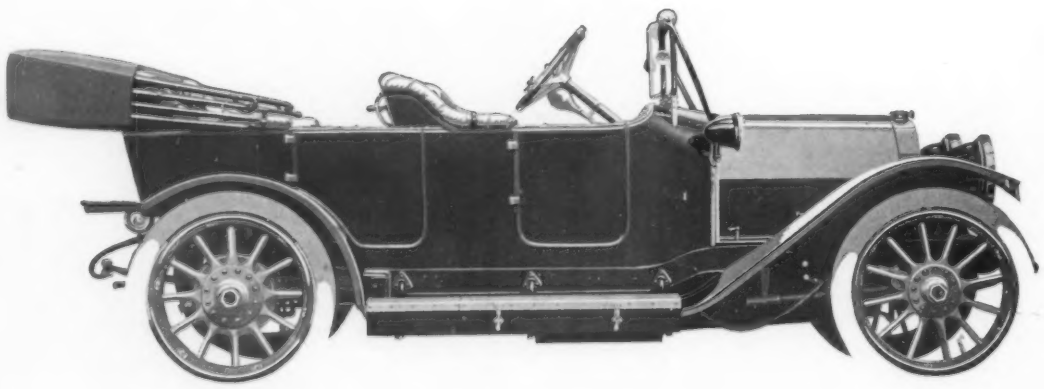
THE unusual equipment and important specifications of this car at this price can but only further impress upon you the economy of producing automobiles in great quantities. This car costs you 30% less than all similar competing current values. An annual production of 40,000 cars is the sole reason. Catalogue gratis. *Address Dept. 27.*

MODEL 71 T

Brewster Green body, ivory striped, nickel plated and dead black trimming
Warner Speedometer
Mohair Top and Boot
Clear Vision Wind Shield
Prestolite Tank

The Willys-Overland Company

Toledo, Ohio



"Thirty-Six" $1950 *(Fully Equipped)*

FIRST!

Automobile history shows that the Chalmers Motor Company has been *first* in almost every important advance that has resulted to the benefit of the motor car buyer.

This fact means much to you as a purchaser. It is your assurance that we will continue to be *first*. It means that the Chalmers owner always has an advanced car—a car that even in its second or third year is never out of date. It is the strongest sort of reason for your confidence in us and in our cars.

Everyone pays tribute to the organization that does a big thing *first*. And public appreciation has kept pace with Chalmers progressiveness.

Here are some facts in automobile history:

The Chalmers Company was the *first* to produce a real automobile at $1500 – the Chalmers "30", placed upon the market July 1, 1908.

The Chalmers Company, in bringing out the "Thirty-Six", at $1800, announced July 1, 1911, was the *first* to offer a medium priced car with self-starter, genuine long stroke motor, four-forward speed transmission, Continental demountable rims, and other features previously found only on high priced automobiles, or not found at all on any cars at any price.

The Chalmers engineers were the *first* to turn their attention to the important matters of comfort, beauty, and convenience in cars of medium price. Having built cars which answered every mechanical requirement, they devoted their efforts to refining their cars in these important respects.

Chalmers "Thirty-Six" for 1913 was the *first* medium priced car to combine the following desirable features: Turkish cushions, 11-inch upholstery, nickel trimmings, electric lights, self-starter, new, roomy, flush-sided bodies, long stroke motor, demountable rims.

The Chalmers Company was the *first* to produce a really great 6-cylinder car at a medium price – a truly maximum car embodying not only mechanical excellence, but the utmost in luxury—and still selling at a moderate price—$2400 to $2600.

The Chalmers Company was *first* in its racing record. It won more contests in proportion to the number entered than any other manufacturer—a record not yet equalled.

A Chalmers was the *first* medium priced car to win the Glidden Tour—and that when the Glidden Tour was a *real* automobile contest under severest rules. Our "30" won under the same rules as the $4000 and $5000 cars.

The Chalmers Company was one of the first to establish itself on a basis of manufacturing practically all of the vital parts of its cars in its own plant.

Making our own parts is not only more economical for us; it is better for you. The parts-maker is in business to make money. His first idea is quantity production at lowest cost to himself. Our first idea, in making our own parts, is quality. We don't have to think first about cost, for we know at the start that we can save the parts-maker's profit.

The wisdom of our policy of manufacturing our own parts will be more apparent in five years than it is today. Because cars are not bought now merely for one year but for several years' use. *Manufactured* cars last longer, and in addition the manufacturer who makes his own parts can always take better care of his owners.

These are some of the points in which the Chalmers Company has led since it started in the automobile business. You can verify them for yourself.

The biggest reason why the Chalmers Motor Company has been *first* so many times is because we have organized our business properly. We have patiently built up an organization where each department head is the best man that could be found for the job. We have fostered the spirit of co-operation between foremen and workmen and executives. We have encouraged our people to think. For we believe that brain power is more essential than horsepower in running a factory.

And so, because our organization was planned well and because we were willing to accept the suggestions of owners, dealers and our own employees, we were able to establish our leadership in the modern price class in 1908. We have been able to hold it by having a good organization. And we expect to continue because we have the organization, the ability, the capital, the factory and the experience to do it.

To tell you more about Chalmers cars and Chalmers methods, we have prepared an instructive and entertaining book, called "Story of the Chalmers Car." Write for it on the coupon.

And see our cars at the dealer's showrooms. Compare them with other cars. Put them to any comparative test and we believe your first choice will inevitably be a Chalmers.

Send in the coupon today, while you think of it.

Reasons Why 1913 Chalmers Cars Are First in the Estimation of Discriminating Motorists

Two great cars claim your attention as the Chalmers offerings for 1913—the Chalmers "Thirty-Six" (4 cylinders) and the Chalmers "Six" (6 cylinders).

The "Thirty-Six" at $1950, is the new model of the most popular car we ever produced, and is equipped with every convenience and comfort. An all-around car at a medium price.

The "Six" at $2400 to $2600 is a truly maximum car in power, comfort and luxury. And yet, through quantity production and unexcelled Chalmers manufacturing facilities, we are able to offer it at a moderate price.

Note these reasons for the popularity of these two cars:

Comfort — Maximum comfort is to be had in the luxurious Turkish cushions, 11-inch upholstery, long wheel base (130" on the "Six"; 118" on the "Thirty-Six"), improved springs, big wheels and tires.

Convenience — No other car offers so many conveniences to make driving simple and easy. Such as Chalmers patented self-starter, Gray & Davis electric lights, demountable rims, dash adjustment for carburetor, ideal arrangement of all control apparatus on dash.

Beauty — Beauty and grace distinguish every line of the new flush-sided metal bodies, the sweeping bell back, the hooded dash. The nickel trimmings, leather lining and sumptuous finish add the finishing touches of perfection.

Safety — The most careful attention has been given by Chalmers engineers to the factors of safety: wheels, axles, frames, brakes, steering gear. All are of a weight and strength to insure against accident.

Long Stroke Motor — The Chalmers motors are ideal for every requirement — mile-a-minute speed, slow running in city traffic, hill-climbing or dogged ploughing through sand or mud.

Four-Forward Speed Transmission — This great improvement — first offered by the Chalmers Company in a medium priced car — affords utmost flexibility. You can always select the gear that will carry your car along — through any kind of going — in the fastest time and with the least motor labor.

Rain Vision Windshield—This splendid, substantial windshield is readily adjustable to suit all conditions.

Special Silk Mohair Top—No better top is offered on any motor car.

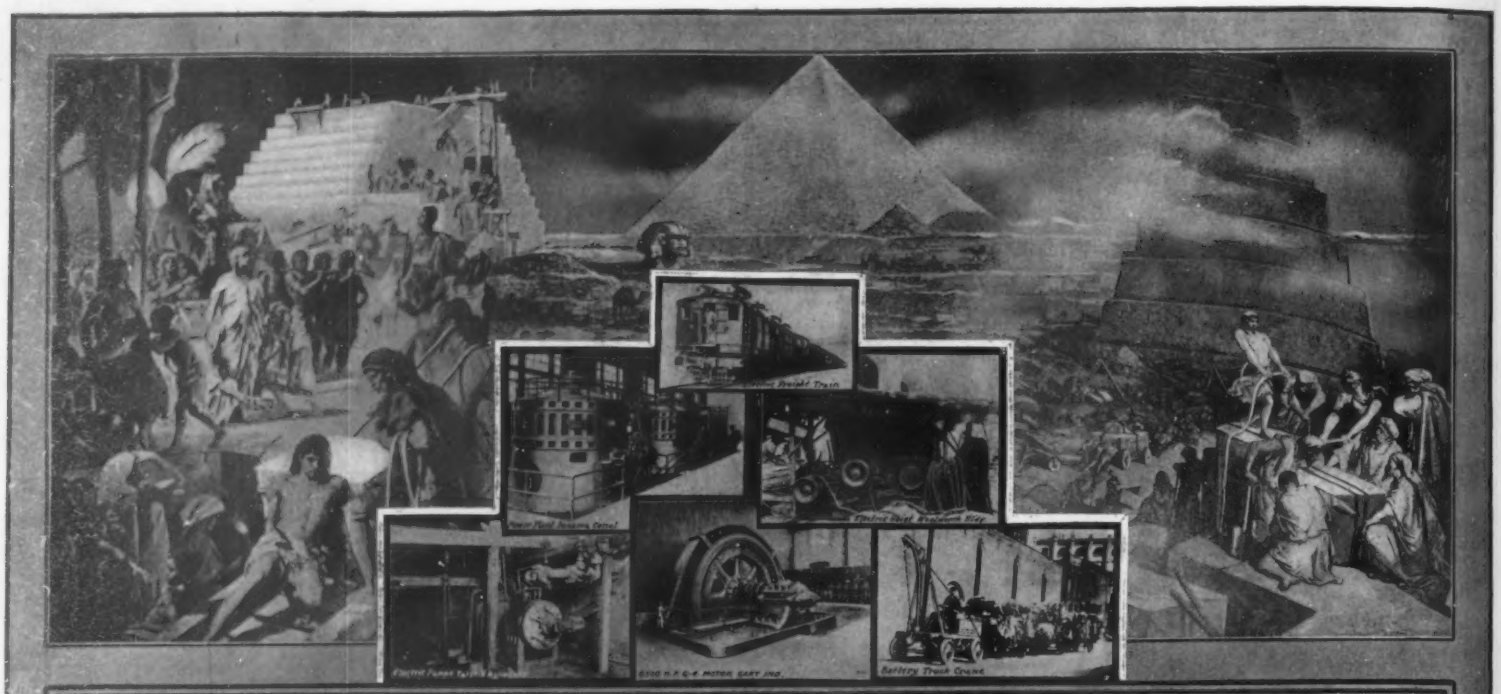
Please send "Story of the Chalmers Car" and 1913 catalog.

Name .....

Address .....

Sc. Am. Oct. '12

Chalmers Motor Company, Detroit



Slaves of Yesterday and Today

The wonderful strides of science in labor-saving devices are well illustrated in the large engineering undertakings of the day as compared with the wonders of antiquity.

It took 100,000 men 30 years to build the Great Pyramid. Today one man could apply the enormous power used at express elevator speed, if assisted by a construction hoist driven by a single electric motor.

More than this, he could raise a continuous horizontal course of the Great Pyramid up a 30° incline at a speed of five feet per minute. To do this he would need a 6500 h.p. motor similar to that built by the General Electric Company and now in use at Gary, Indiana, turning out steel rails which girdle the earth with highways.

Power for Construction

Instead of man or ox power electric power could have been derived from the water running to waste between the banks of the Nile. This is being done at Panama where the Canal, which is being built largely by electric power, will be operated entirely by electric power from a hydro-electric station at Gatun. Practically all of the electrical apparatus purchased for operating this, the greatest engineering feat of the world, was furnished by the General Electric Company.

Lighting the Work

With electric lights night would not have interrupted the work on the Pyramid or Tower of Babel. At Gatun, Canal Zone, the cableway unloaders were operated at night with great success, using searchlights furnished by the General Electric Company.

Pumping Water

Water in the excavations and drinking water for the armies of laborers must have been a great problem for the Egyptians. Along the Catskill Aqueduct, the second greatest engineering undertaking of the world, water is being pumped from the workings, and the laborers' camps supplied with pure drinking water by the most efficient method—electric motor driven pumps. Over 90% of all electric equipment used by the various contractors on the Catskill Aqueduct was furnished by the General Electric Company.

Building to the Clouds

The Great Pyramid is 451 feet high while the Woolworth Building, New York City, is 750 feet, making it the highest office building in the world. Practically all the material used in this building was raised to position by hoists driven by General Electric Company motors.

Freighting Material

Slow moving lines of slaves and ox carts carried the building materials to the pyramids and cleared the debris away afterward. Visitors and inspectors were borne on the shoulders of slaves. Today long freight trains carry the wealth of the nation and passenger trains rush at great speed to all parts of the country. The electrical apparatus which moves them has been largely developed by the General Electric Company. The electric power comes hundreds of miles from mighty power plants located over great coal mines or beside rushing cataracts.

Recording the Achievement

The Egyptians told of their achievement in building the pyramids by slowly cutting hieroglyphics on stone. Today, a few hours after it has happened, the news of the day is reproduced by that wonderful mechanism—the modern printing press. The millions of copies of daily papers in the large cities of this country are produced by giant presses driven largely by electric motors. The simple pressing of a few buttons gives the printer perfect control over his press where the G-E motor drive is used.

Working Conditions Improved

As electricity has reduced the physical work of man and increased the amount of work one man can do it has improved his working conditions until now a well housed man can move a small handle and do the work of an army slaving out among the elements.

During the development of electricity as a labor-saving agent many electrical companies have come and gone, making few marks on the sands of time.

In sharp contrast to these the General Electric Company has occupied a leading position in the electrical industry from its inception, which was contemporaneous with the first practical application of electricity, the world's greatest labor saver.

General Electric Company

Largest Electrical Manufacturer in the World
General Office: Schenectady, N.Y.

ADDRESS NEAREST OFFICE

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boise, Idaho
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
(Off. of Sol'g Agt.)
Erie, Pa.
Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Iowa
Knoxville, Tenn.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Pittsburg, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah
San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Youngstown, Ohio

For Texas and Oklahoma business refer to General Electric Company of Texas,—Dallas, El Paso, Houston and Oklahoma City
For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont.

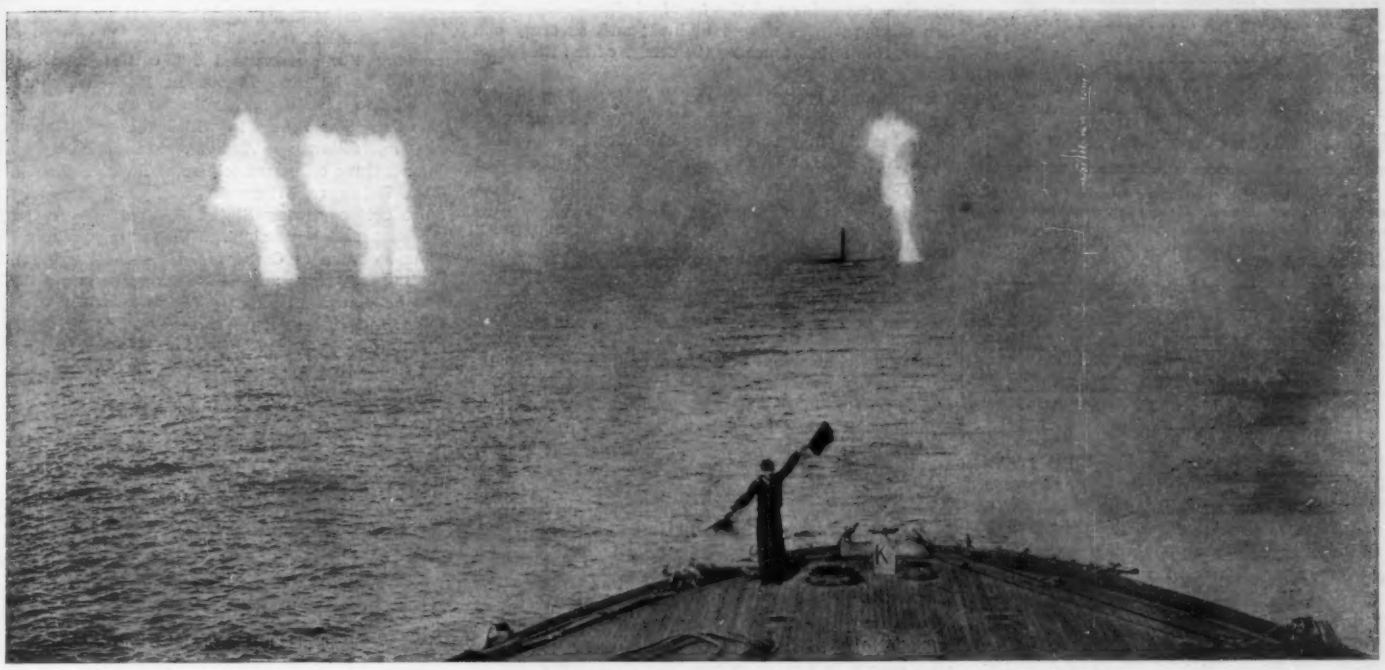
3847

SIXTY-EIGHTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

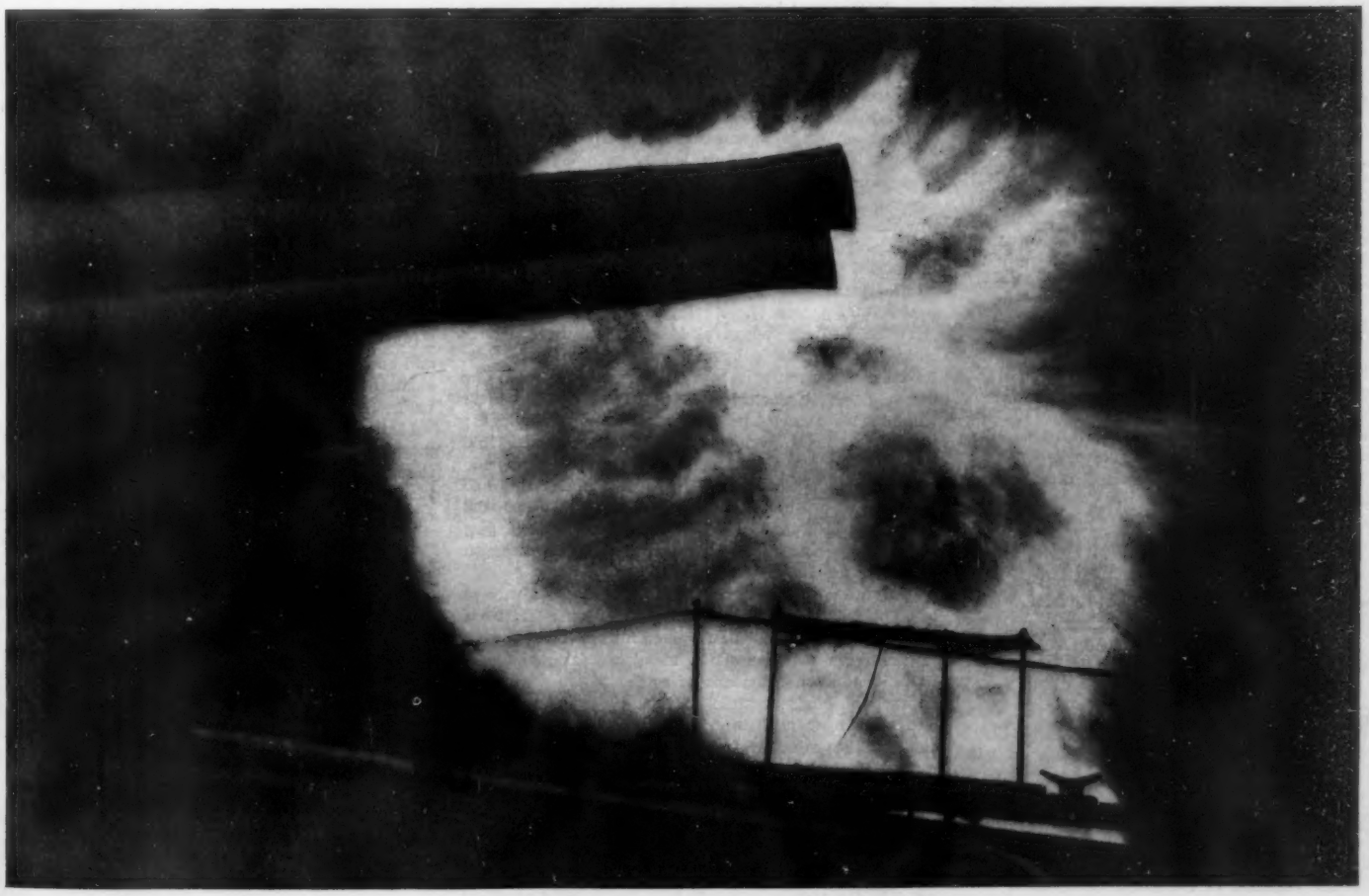
VOLUME CVII. NUMBER 15.] NEW YORK, OCTOBER 12, 1912. [PRICE 15 CENTS $3.00 A YEAR



Copyright 1912 by E. Muller, Jr.

In foreground seaman is wig-wagging result of shots from stern of "Nebraska," which is towing the target 350 yards astern. Three of the four shots have passed through target, the fourth, a ricochet, will also strike

Four hits by 12-inch shells fired at 14,000 yards by battleship "Kansas."



Copyright 1912 by E. Muller.

This picture was taken by the light of the flash of white-hot powder gases.

Night firing. Discharge of a pair of 8-inch rifles on board the flagship "Connecticut."

THE IMPOSING NAVAL REVIEW AT NEW YORK.—[See page 306.]

SCIENTIFIC AMERICAN

Founded 1845

NEW YORK, SATURDAY, OCTOBER 12, 1912

Published by Munn & Co., Incorporated. Charles Allen Munn, President
Frederick Converse Beach, Secretary and Treasurer;
all at 361 Broadway, New York

Entered at the Post Office of New York, N. Y., as Second Class Matter
Trade Mark Registered in the United States Patent Office

Copyright 1912 by Munn & Co., Inc.

Subscription Rates

Subscription one year $3.00
Postage prepaid in United States and possessions
Mexico, Cuba, and Panama

Subscriptions for Foreign Countries, one year, postage prepaid. 4.50
Subscriptions for Canada, one year, postage prepaid, ... 3.75

The Scientific American Publications

Scientific American (established 1845) ..... per year, $3.00
Scientific American Supplement (established 1876) . " 5.00
American Homes and Gardens ..... " 3.00
The combined subscription rates and rates to foreign countries including Canada, will be furnished upon application.

Remit by postal or express money order, bank draft or check

Munn & Co., Inc., 361 Broadway, New York

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

A Warning Neglected

ONCE more an express train has been thrown from the track at one of those short cross-overs from express to local tracks which are a standing menace to the safety of railroad travel. The accident is the more inexcusable because the New York, New Haven and Hartford Railroad Company, upon whose lines it occurred, was reminded of the danger only last year, when a similar accident occurred to an express train just outside of Bridgeport. The stretch of line on which both accidents occurred has four tracks, the center tracks being generally reserved for express travel and the outer tracks for local trains. When an express train is to make a stop at a station, it has to pass from the inner to the outer track, and this is accomplished by means of a cross-over. Safety of travel demands that these crossovers shall be of such a length that the curvature at the switches shall be "easy," so that if an express train should enter the crossover at high speed, it will not be in danger of derailment. That would be good and safe construction. As a matter of fact, from motives of economy and convenience, these crossovers are made comparatively short, with sharp curvatures at the switches, and a standing order is given that speed shall be reduced to a low limit in making the transfer. If the engineer obeys such orders to slow down, well and good; but it often happens that, either through carelessness or desire to make up time, the cross-overs are taken at a speed too high for safety. This is what occurred last year at Bridgeport and this year at Westport. We pointed out at the time of the Bridgeport disaster that such accidents could be prevented by doubling the length of the crossovers. Had this been done at Westport, the train in all probability would not have been wrecked. This subject is one that may well be commended to the serious attention of the Interstate Commerce Commission.

Honor to Whom Honor is Due

UNDER the title "Eugenics must surely at last be coming to its own," our esteemed contemporary, *American Medicine*, makes some editorial comments which seem to us decidedly unfortunate. The writer opens his remarks with the words: "By the time that an innovation gets real acceptance in England, it must amply justify its existence in other countries." Further we read again: "A final proof of the permeation of eugenic principles, even in slow-moving England, is to be found in the presidential address of the Archbishop of York . . . "

Are we to infer that the writer is so grossly ignorant as not to know that the whole movement for eugenics originated in England, that even the word *eugenics* is the creation of the great Sir Francis Galton, whose death we mourned last year? Is our contemporary unaware of the fact that the world's chief center in this movement is at University College, London, where one of England's foremost scientists, Prof. Karl Pearson, is director of the Eugenics Laboratory founded and endowed by Sir Francis Galton?

Or has his patriotism carried away our esteemed contemporary, inspiring those more fervid than judicious remarks? Indeed, is patriotism a proper definition for an emotion which thus clouds a man's judgment? National prejudice seems a more apt term to describe it. Let our patriotism be such as to invite commendation and not condemnation. Let us be fair, and give honor to whom honor is due.

Pulicide

SOME may imagine it to be an easy thing to kill a flea; such delusion will be dispelled by the following statements, which are authoritative, being based on a report on *Flea Destruction* of the United States Public Health and Marine Hospital Service. It should be premised, however, that the investigation noted, though thoroughly scientific, was limited in scope; for only the *Pulex irritans*, the *Hoplopsyllus anomalus* and the *Ceratophyllus acutus*, with two other varieties were examined; and, as every one knows, this is but touching the fringe of the flea question.

Pretty much every insect can be destroyed by corroding it with chemicals, or by suffocating it outright, or by euthenizing it with ether or chloroform or laughing gas. Not so, however, the festive flea, which will survive all these modes of execution combined, with others added. It will survive the agency which kills its "host," such as the rat or the squirrel; and (with its marvelous power of jumping across infinite distances) will find a new boarding place in another hospitable and as yet unvivified pelt. Besides, when can one say that pulicide is a deed accomplished? A flea that has not moved for half an hour has been pronounced dead; yet the abandoned creature has afterward sprung up as ready as ever for the part allotted it in the cosmic scheme by a hopelessly inscrutable Providence. Again, what were the conditions of the flea before the attempted vivisection? Was it moribund, or was it physically up to par? It has been calculated that, size for size and weight for weight, if a man's jump had as much power behind it as a healthy, robust flea's, he (the man) could easily, from the street, clear the golden ball topping the flagstaff of the Singer building. So, for the conditions of the experiment, it should be known beforehand if the creature has its jump in normal working order. Again, climatic conditions must be considered; the flea will hop and bite with energy in dry, crisp weather; on a soggy day he may not care to do these things, and so may only seem to be dead.

It is almost impossible to drown fleas by dropping them into water; but soap and water will do for any flea. Thus is the flea the hobo among insects; for dipped in tincture of green soap he is dead beyond peradventure in two minutes, and no flea of the five kinds indicated could live after being soaped. Another evidence (among so many) of the disreputable character of the flea is that when soaked in absolute alcohol, he may become paralyzed; but he will certainly recover, and (as in the old song) when one puts his finger on him, behold he is not there. The strongest whiskies are only fifty per cent alcohol; and there is surely no record of any human survivor who has been submerged in whisky; yet fleas come out seemingly all the better for it, after being soaked in absolute alcohol (98 per cent). Again, a flea left to swim in formalin (a very powerful insecticide) was "apparently dead in twelve hours," but "revived." It took 100 per cent phenol more than one minute to kill a flea, etc. The conclusion is that water is of little value in flea destruction; glycerine is practically inert; alcohol is practically inefficient; kerosene and miscible oil are efficient; formalin, phenol, mercuric chloride and trekesol in the strength used as disinfectants are of little value, and powdered sulphur of none; the fumigants, bisulphide of carbon, hydrocyanic acid gas, and sulphur dioxide are "highly efficient in the strength employed for flea destruction."

It would seem, on the whole that the surest way to kill a flea (and be able to testify under oath that he is really defunct) would be to place him on one of those impenetrable plates used in naval warfare, and confine him thereon by means of cables fastened securely to each of his several legs; then to train upon him (from as near a distance as would be feasible) an irresistible projectile from one of those twelve-inch guns. If the flea should not (by reason of the phenomenal spring mentioned) break away and get out of range, it might fairly be assumed that its destruction beyond resurrection had been consummated; that is, considering the unerring aim for which the American navy is so justly famous; if the experiment were tried in the Cuban or the Patagonian navy, one would be rash to guarantee the result.

The Farmer and the Beef Famine

NO other one thing contributes more to the success of the Americans in mechanical endeavor than beef—good red-blood-making material.

Nobody knows better that there is a beef famine than the mechanic. Nobody will appreciate more readily why there is one than he when he is informed that the number of beef cattle on the farms of the United States have declined from *fifty-one and a half million* in the year 1907 to *thirty-seven and a quarter million* in 1912 (Year Book of the U. S. Dept. of Agriculture, 1912, page 629), and that the decline still continues at the rate of about *two and a half millions a year*. No structure of any kind, whether intended for human habitation or human food, could stand such a loss as this on its underpinning without damage and loss of the most serious kind.

To a mind trained in mechanics or physics it is clear that the trouble is lack of trusses instead of presence of trusts.

OUR BEEF STRUCTURE NEEDS ADDITIONAL SUPPORT.—Where are we to look for it? In spite of the high prices of cattle and the good prospect of profit, out of all the States in the Union only one, Florida, a cotton-growing State, increased its cattle; namely, from 736,000 in 1911 to 758,000 in 1912—not much, but enough to give a very valuable suggestion, as will be seen. The States in which there was no decline are as follows: Vermont, Massachusetts, Rhode Island, three comparatively small New England States. Then Delaware, Wisconsin, Utah, and Nevada. Next more cotton-growing States, Georgia, South Carolina, Alabama and Mississippi. All the big ranching States from Montana to California, including Texas, and excepting only Utah and Nevada, showed heavy declines. The logic of this is clear: We must look in the future to the farms and not to the ranches for our beef.

If we look carefully for that portion of the country in which we can hope most quickly to increase our beef supply, we will find it without the least doubt in the cotton-growing States. There is now grown and going to waste in these States enough grass to raise and fatten enough more cattle of the right sort under favorable conditions to reduce the price of dressed beef five cents a pound to the consumer, and still leave a handsome margin of profit to the cattle grower. Those by-products of the cotton plant itself, cottonseed meal and hulls, are extraordinarily abundant and cheap, hulls at less than half the price of hay, and meal at less than half the price of corn. Over one thousand mills are making this feed and are scattered from one end of the cotton-growing territory to the other. Enough more grass is ploughed under in the clean cultivation which cotton requires, to quadruple the number of cattle now in the South. If the other cotton States will follow the example of South Carolina of intensive cotton cultivation and the liberal use of commercial fertilizers, they will be able to raise as much cotton as they are doing now, with less cost per pound, and can use with advantage 25 per cent of their present cotton acreage for pasture. (South Carolina gets 280 pounds lint cotton per acre to Mississippi's 170 pounds per acre.)

There are plenty of native cattle already in the South to make a start with, though most unevenly distributed and varying greatly in quality and size, as shown by their number in proportion to population and value at the farm. For instance, North Carolina has about one head to six of population—value $12.60; Georgia, about one head to four of population—value, $11; Mississippi, about one head to three of population—value, $10; Oklahoma, about one head to one and one third of population—value, $21.50; and Texas, about one and one third head to one of population—value, $17.

If the older cotton States had as many cattle in proportion to population as Oklahoma and Texas (and the same sort of cattle) as they might have by natural increase with pure blood beef sires in ten years without importation, the beef problem would be solved.

It is not cotton mania that has prevented an abundance of good cattle in the old cotton States, but partly the presence, partly the injury wrought by the cattle tick, but chiefly ignorance and indifference. Intensive cattle raising, with the minimum of pasturage and the maximum of feed raised and carried to the cattle, coupled with intensive cotton production with commercial fertilizer, is the greatest aid we have to cotton growing, and it will be along this line that the old cotton States will be induced to grow cattle. The Government is already pecking at the cattle tick by counties with mild aid from county and State. A vigorous campaign by National and State governments with men and money behind it could eradicate the cattle tick completely and forever from the United States in one year. A campaign of education equally able and vigorous for the same length of time would convert the South to cattle raising of the right sort, not in place of, but in aid of cotton growing.

There is not a consumer of beef in the United States, nor a packing house in the country, a cotton mill, oil mill, fertilizer factory, merchant, planter or banker in the South that would not be greatly benefited by two such joint movements.

Engineering

Reduction of Railroad Speed.—The Pennsylvania Railroad Company has issued orders restricting the maximum speed of all passenger trains on the system east and west of Pittsburgh to seventy miles per hour. Careful consideration has also been given to the existing speed restrictions on curves.

Speed of the "Princess Royal."—It has been unofficially announced that at the recent test of the new British battleship cruiser "Princess Royal," which is a sister vessel to the "Lion," the new vessel exceeded the record of 31.7 knots made by the latter battleship cruiser. The "Princess Royal" is driven by turbine engines of from 70,000 to 75,000 horse-power. Her displacement is 26,350 tons and she carries eight 13.5-inch guns in four turrets, so disposed that they can all be discharged either ahead or astern or on either broadside.

New Depth Record for a Submarine.—The new submarine boat "F-1" established a world's record for depth during a six-hour submerged cruise in San Francisco Bay on September 5th. The boat went down to a depth of 283 feet. The vessel maintained this depth for ten minutes while traveling at a speed of six knots, then rising to a depth of 19 feet, it proceeded at a speed of eight knots. The previous record for depth was held by the "Seal," a Lake type submarine, officially designated "G-1," which went down to a depth of 256 feet.

The New Transatlantic Liner "Britannic."—The White Star Company has made the official announcement that the new 50,000-ton liner now under construction will be christened the "Britannic." This vessel, which is similar to the "Olympic," will be the largest British-built ship in the world. It will contain a number of changes in design so as to protect it from a disaster like that which befell the "Titanic." It will be provided with a complete inner skin extending well above the load line, throughout the vulnerable parts of the vessel. The bulkheads will also be higher, and the vessel will be able to float with six compartments flooded.

Largest Freighter in the World.—The largest vessels in the world designed for carrying freight exclusively are the "Col. James M. Schoonmaker" and the "William T. Snyder, Jr.," built for operation on the Great Lakes. They measure over all 617 feet, molded beam 64 feet, molded depth 33 feet, with a deadweight carrying capacity at 20-foot draught of 13,200 tons. The vessels carry water ballast in side tanks and in a double bottom which is 6 feet deep. The total water ballast capacity is 9,440 tons. Each vessel is equipped with a quadruple expansion engine of vertical inverted type with an estimated horse-power at ninety revolutions per minute of 2,600.

Terminals for the Barge Canal.—In order to take care of the traffic on the New York State barge canal, which will be completed in 1915, an expenditure of $18,800,000 has been authorized for canal terminals in New York city and other cities along the canal. In New York city there will be fourteen canal terminals, costing altogether $9,740,000. The balance of the money will be spent in building terminals at twenty-one different cities and towns. Warehouses, sheds, cranes, derricks, etc., will not be built at the terminals until after the canal has been completed and the character and quantity of the freight to be handled has been determined.

Capacity of the Gatun Lake.—During the week from September 2nd to September 9th, 5.74 million cubic feet of water poured into the Gatun Lake, raising its surface from 39.06 feet above sea level to 42 feet above sea level. The total quantity of water reached 40.03 million cubic feet which is equivalent to 299,424,400,000 gallons. For purposes of comparison we may consider the Rio Grande reservoir, which when filled has a capacity of sixty-five and a half million cubic feet, or less than one seventh of the average daily flow into the Gatun Lake. When the surface of the lake reaches a level of fifty feet above the sea it will contain 58.65 million cubic feet of water, and when it reaches eighty-seven feet, or the proposed maximum level, the lake will contain 192.25 million cubic feet.

"Selandia's" Consumption of Oil.—Some interesting statistics on the oil consumption of the Diesel engine-driven "Selandia" are given in *Engineering* (London). On the outward maiden voyage the weather was fair after the first two or three days. On March 11th, the first day out, the oil consumption was 9.8 tons, and a speed of 9.2 knots was maintained. The highest speed was 12.7 knots, which called for a fuel consumption per day of 10.1 tons. The most efficient day's run required the use of 9.6 tons of oil, with which a speed of 12.4 knots was developed. On the homeward voyage the weather was decidedly unfavorable, and yet the daily consumption of oil did not exceed 8.8 tons. The best day's run was made on 8 tons of oil, with which a speed of 8.3 knots was maintained. Had the steamer used coal in place of oil, it would have required three or four times as many tons of fuel.

Electricity

Wireless Iconography.—We learn from *La Revue* that a young Italian experimenter, Francesco de Bernocchi, the son of a Turin merchant, has been successful in his attempts to send pictures by the Marconi process. Though only 25 years of age he has been interested in the subject, it is stated, since 1897, having been inspired by Prof. Rhigi's investigations of the Hertzian waves. He has now succeeded in transmitting images, drawings and autographs which retain the precise features of the original with great fidelity.

Electric Signs in Uruguay.—According to the report of United States Consul, F. W. Goding at Montevideo, Uruguay, American electric signs are being introduced into that country and are becoming very popular. Recently an electric display sign with a capacity for forty advertisements was installed in Montevideo. Each advertisement is displayed for seven minutes. The young Uruguayan who installed the sign has found it so successful that he is planning to install a number of others of greater capacity in other cities of South America.

Wireless Telegraphy Spark Gaps in Running Liquids.—In wireless telegraphy the spark in the electrically oscillating circuit is liable to degenerate into an arc where large amounts of energy are used. Recent experiments to determine the effect of interposing a running liquid in the spark gap have shown that the voltage required is lower than in air and that the efficiency depends on the rate of flow of the liquid and upon the voltage applied, and not greatly upon the length of the gap. Water may be used, but oil gives better quenching and eliminates the deafening noises of the air spark.

Effect of Carbon on the Conductivity of Steel.—According to statistics published in *Comptes Rendus*, the resistance of carbon steel increases with the per cent of carbon. The resistance of nickel steel also increases with the addition of carbon and also with the increase in percentage of nickel up to 35 per cent. In manganese steel the percentage of carbon does not seem to affect the resistance to any great extent. The greatest resistance is found when 12 to 13 per cent of manganese is used. Chromium steel, too, seems to be unaffected by the carbon content, but the resistance is increased and reduced periodically with the increase in percentage of chromium. Tungsten steel also shows a variation that is quite irregular.

A Large Protective Reactance.—An effective way of automatically protecting large dynamo-electric machines from momentary short circuits is to include a "reactance coil" in the outgoing circuit of the machines, the electromagnetic inertia of this cell serving to check the abnormal rush of current. The 5,000-kilowatt turbine-generators installed in a London electricity supply station are now adequately protected from the severe strain of the momentary "shorts" which are common to electric railway service by a large oil-immersed water-cooled reactance coil designed to reduce the short-circuit current to somewhat less than one half the value it would otherwise attain, namely, 10,000 amperes. The coil reduces the power factor less than 3 per cent.

Why do Electric Waves Follow the Earth's Curvature?—An interesting hypothesis has recently been suggested by an English physicist to explain how it is that electro-magnetic waves emitted at a wireless telegraph station in Cornwall can be received at a station on the coast of America. If we compare such a sending station (as far as wave-length is concerned) to a source of light on the surface of a sphere about ¼ inch in diameter, obviously no light from the source could reach even one quarter of the way around the sphere; but if the sphere is surrounded by thin envelopes of media whose refractive indices decrease from the inner to the outermost, light will be transmitted all around the sphere by successive refractions and reflections. According to the new hypothesis the electric waves are transmitted in an analogous way, viz., by the variation in ionization of the earth's atmosphere.

The Telephone for Detecting Faults in an Alternating Current Supply.—A telephone device called the phasophone, for determining faults in alternating current cables at their inception, thereby preventing loss and delay by serious short circuits, is described in a German magazine. The instrument, which consists of a mica condenser, a telephone receiver, a spark gap, a non-induction resistance of about one megohm, is employed by connecting it to the particular cable which it is desired to test and listening for five or ten minutes at a stated time each day to the musical note given by the telephone receiver. The alternating current generated by the supply station normally gives a pure tone in the receiver, but if there is a leak of varying resistance, caused for example by a "swing" on the line, the tone is interrupted; and characteristic interruptions of the tone are caused by bad contacts, faulty operation of generators, etc. Once the existence of a fault on a particular cable is detected by this means, the location of the fault can readily be found.

Science

An Interesting Etruscan Sarcophagus.—An interesting Etruscan sarcophagus adorned with bas reliefs representing episodes of the siege of Troy and bearing traces of their original coloring has been found in a tomb.

Hydrogenated Oil and Milk Butter Substitute.—Carleton Ellis of Montclair, N. J., has secured a patent for a butter substitute or butter-like composition in which edible hydrogenated oil is incorporated with milk material by emulsification.

Discovery of a Relic of Andrć.—A telegram from Tromso received at Christiania on September 13th states that the Norwegian steamer "Beta" discovered on September 1st, to the south of Foreland, a buoy marked "Andre's North Pole Expedition, 1896, No. 10." The buoy was made of cork and covered with copper.

Making Holes in Rubber Corks.—In making holes in rubber corks much annoyance is caused by the punch making "tapering" holes and "running to the side." A little ammonia water poured on the rubber and the boring instrument causes the hole to become of uniform size at every point and the operation is accomplished with much more ease.

How to Clean Gas Mantles or Gas Burners.—A good way to clean gas mantles or gas burners that are blackened by carbon deposits is to sprinkle sodium chloride or "salt" upon them while burning. This causes the carbon to burn away and prolong the life of the mantle and increase the efficiency of the light or burner. In laboratory combustion furnaces deposits of carbon can thus be removed.

Honors for an X-ray Victim.—Mlle. Weidemann, said to be the first victim of duty to the cause of the X-ray, has been decorated with a medal by the Minister of the Interior of France. Mlle. Weidemann was employed in 1898 in the radiographic laboratory of a hospital. Hardening of the skin had set in. Last year she had to have both hands amputated. Ultimately she must die; for the amputation of her hands has not stopped the ravages of the disease.

Railroad Dust as a Germ Carrier.—The interest taken of late in the subject of dust, especially along common carriers, is such as to attract attention in all quarters. Recently the Hon. Judson C. Clements of the United States Interstate Commerce Commission has expressed his opinion as to the dust discharged along railroads and similar public highways. It transmits disease germs of a contagious character, he stated, and announced his advocacy of a general law for the regulation of the matter in the interest of the public health. Such a law would doubtless bring forth improvements in the means for controlling the discharged dust and should be of interest to inventors skilled in the subject.

The Twelve Biggest Brains in the World.—In point of brain weight, the following in the order named are the twelve leading names, the weights being indicated in grammes: Ivan Tourgenief, Russian novelist, 2,102; Joseph Bouny, French jurist, 1,935; George Cuvier, Franco-German naturalist, 1,830; E. H. Knight, American mechanician, 1,814; Franz X. Kraus, German theologian, 1,800; John Abercrombie, Scottish physician, 1,786; Benjamin F. Butler, American statesman, 1,758; Edward Olney, American mathematician, 1,701; Herman Levi, German composer, 1,690; A. Winchell, American geologist, 1,666; William M. Thackeray, English novelist, 1,658; Rudolf Lenz, German composer, 1,630.

The University of Frankfort.—Measures are being taken to organize a new university at Frankfort, and recently the Prussian government authorized this measure, provided the municipality would engage to supply the necessary funds for constructing the university buildings and keeping them up. Burgomeister Adickes now states that the needed amount of capital amounting to $1,800,000 has been entirely subscribed, so that the founding of the new university is an established fact. We may also note that E. Solvay, desiring to contribute to the work undertaken by Prof. Nernst, who is director of the Physical Chemistry Institute of the Berlin University, has offered the sum of $2,000 which will be renewed every three years.

Eighteen Thousand Dollars for the Jardin des Plantes.—An anonymous donor has lately made a legacy of $18,000 to the Natural History Museum of Paris (Jardin des Plantes), and this sum will be devoted partly to making improvements in the laboratories of zoology and anthropology and in part to the maritime laboratory at Tatihou on the Channel coast. On the other hand it is announced that the extensive collections of fossils from the Paris region, Albania, Australia and Tasmania, belonging to the eminent paleontologist Bounet, recently deceased, have been left by him to the museum. He bequeathed his entire fortune to the Academy of Sciences. M. Osmond, the well-known metallurgist, left the sum of $20,000 to the Science Mutual Aid Society, $20,000 to the Encouragement Society and $60,000 to different philanthropic institutions.

While the cost of grading is heavy, stone for the foundation and other work costs practically nothing.

How One County Built a Good Road

The Story of a Brick Pavement in West Virginia Hills

By J. M. Miller

The road follows the bed of a small creek for a short distance in a narrow valley. It was necessary to cut an entirely new road.

THE precipitous hills overlooking the Ohio River, in Grant district, Hancock County, West Virginia, and about forty miles from Pittsburgh, will soon be traversed by fine brick-paved driveways suitable for the speediest automobiles and surpassed by few boulevards in Pittsburgh. The farmers of the district, some of them living in one-story cottages and keeping their horses and cattle in log stables built one hundred years ago, have authorized the expenditure of $125,000 for the construction of paved highways, and the laying of bricks has already been commenced. Ten miles of roadway nine feet wide is to be paved with brick.

Most of this road winds up and down hills almost as precipitous as mountains. In some places the roadway climbs the hill at an angle of almost forty-five degrees with a sheer drop on one side of hundreds of feet, while on the other there is a high cliff. Many of the hills traversed by these roads are densely wooded and in some places the roadway before paving, appeared to be little more than a mountain trail. The paved road will be paralleled by a dirt driveway of the same width as the pavement wherever the lay of the ground will permit it.

It was only by clever political strategy, such as would have done credit to the boss of a downtown ward in a large city that the persons interested in the improvement were able to get even a small bond issue to provide funds for the work. A special election to determine whether Grant district should issue road improvement bonds to the amount of $125,000 was requested by petition for October, 1911. In October the roads in Hancock County are nearly always muddy, and in 1911 the indications were that they would be worse even than usual. In this the promoters of good roads were not disappointed. Buggy wheels sank deep into the soft elastic clay and horses could barely struggle through the mud. The result was that farmers who had previously opposed the issue of bonds to pay for better roads, voted in favor of the project after they had struggled through the mud to the polls. Moreover, it being a special election to decide upon road bonds only, many voters not particularly interested in the measure stayed at home. Most of these men would have voted conservatively against any increased expenditure of public money on general principles, had they been drawn to the polls by the varied interests of a general election. As it was they were not quite energetic enough to venture out over the muddy roads to oppose an effort to secure better ones. The clever planning of the good roads advocates was rewarded for the vote showed that forty-seven in excess of the required sixty per cent of all votes cast were secured in favor of the bond issue.

Prior to the vote on the bond issue in Grant district two efforts had been made to secure the peoples' approval at the Hancock County polls for a large bond issue to be expended for the improvement of the principal roads of the entire county. Each time the total vote of the four districts in the county was against the improvement. In Grant district only, where the farms are roughest and stoniest, and where the farmers are poorest, was the vote favorable to the bond issue. In order to take advantage of the favorable local sentiment the promoters of good roads arranged with the Hancock County court to give Grant district an opportunity to vote separately on a smaller bond issue for the improvement of its own roads. Clever management of the campaign and a wet election day did the rest.

Following the election the county court appointed a commission to prepare and market the bonds. When this work had been done, in order to remove any suspicion of collusion and graft, a second commission composed of different men from the first, was appointed to determine what roads were to be improved, to select the materials, and to have charge of the actual work.

The first and perhaps the most difficult task was to determine what roads should be improved, for prior to the election the farmers along every byroad in the district had been encouraged to believe that the highway leading through his farm stood just as good a chance of being improved as any other. Where a farm was very remote the owner's support for the bond issue was sought by a

(Concluded on page 311.)

It was decided to pave the road with brick as far as the Pennsylvania State line, a distance of three and one half miles.

The contract for grading, paving and curbing was let by competitive bidding after the specifications had been well advertised. Local farmers, however, did much of the grading.

Graded and ready for paving. The paved road will be paralleled by a dirt driveway of the same width as the pavement wherever the lay of the ground will permit it.

In some places the roadway, before paving, appeared to be little more than a mountain trail with deep hollows in which water had collected.

With minimum of friction and slow speed of chain travel, very little power is required to keep the ice moving and to elevate it at the bridge.

A 2½ horse-power motor, connected by 200 feet of flexible cable with the electrical supply of the nearest building, drives the ice harvester.

Harvesting Ice by Electric Power

A Home-made Ice-carrying Machine

By Putnam A. Bates, E.E.

FOR several years I have struggled through the winter season with the feeling that another year I would find a better plan for filling my ice house than that which is customary in our section of New Jersey.

The standard method with us has been to engage several teams early in the winter season and to give the instructions that at the first "spell" of ice weather those teams were to haul, until the two-hundred tons had been safely put away. To the average person this might seem sufficient to get the job done, but, to one accustomed to rural conditions such an understanding has nothing definite about it. For example, my instructions were just the same as those from eight or ten other farmers in the same locality, and the teams referred to are continually working around here, there and everywhere. They work when it is clear, but not when it storms, the result being that probably three times as much work is engaged for as would be possible to carry out.

On this basis it is plain to see that some one must be disappointed, and it may or may not be my turn, depending upon how the problem works itself out. And again the lake we all cut from is some five miles away, over hill and dale, so that one load a day per team is apt to be the maximum rate of transportation.

What a pleasant surprise, therefore, it was when one day this spring, just after I had settled up with my teamsters for the usual winter ordeal, on a basis that made the cost of a ton of ice on a par with a ton of coal, to receive from a friend in a neighboring county a letter telling how he had designed a mechanism operated by electricity that would harvest all the ice you could possibly need, right from a little pond near at hand and without the services of a single wagon, sled or team.

The accompanying illustrations show pretty clearly the general scheme. The inventor of this ingenious labor-saving method is Schuyler S. Wheeler, who farms on a somewhat larger scale than I do, just over the Bernardsville Mountain in the county of Somerset.

Mr. Wheeler calls this mechanism an "ice-carrying machine," and, in fact, that is just what it is, for the blocks of ice when once on the runway are drawn along by an endless chain which in turn is driven by an electric motor supplied with current from a small generating plant which was installed for the purpose of lighting the house and outbuildings.

Present method of cutting ice. Hand sawing is slow work. An electrical motor could be mounted on the carriage of a circular saw; the mechanism being drawn over the ice as with a horse-saw.

Harvesting ice with traveling chain and electric power. The ten "flghts" are 33 feet apart on the chain, five on the "going side" of 165 feet. The return trough for the chain is fastened up tight against the slide on its underside.

The complete harvesting outfit is shown in the illustration. Under its initial test it proved eminently practical and satisfactory in every way, and made it possible to harvest about two hundred tons of ice, using five men and no teams, in four days. Previously it had been the custom to employ four to six teams, four or five days, in addition to these men. While the outfit was constructed only with a view to meeting the needs of a small private plant, there is no reason why the construction should not be made heavier and the same idea applied to commercial undertakings of like character. In the instance cited, however, the "rig" was made light enough and simple enough to be warranted in a private place.

The "flights" are 33 feet apart on the chain, and there are ten of them in 330 feet of chain, or five on the going side, covering a distance of 165 feet. The slide was made in 12 or 14-foot sections, each one having at one end only a cross batten or supporting foot, the other end resting on the battened end of the next section. The return trough for the chain is fastened up tight against the slide on its underside and the whole rested directly on the ground. Immediately after harvesting, the chain was taken off and the sections lifted and nested on top of one another in a little covered shed or shelter alongside of the ice house.

The working head is supported on a rectangular wooden frame, which rests and locks on four short posts set permanently in the ground. The power was brought from the nearest building having electric light, by 200 feet of flexible cable. The 18-inch diameter sprocket wheels made 28 revolutions per minute, and at this speed the chain picked up a cake of ice four times in fifty seconds. The elevating bridge was hinged at a point alongside the main shaft and not upon it, to relieve it of friction, and this and the slow speed of the chain and one or two other power-saving features, resulted in the operating of the whole with 2¼ horse-power of electricity when the bridge was half elevated, as shown in one of the engravings. When fully elevated about 2½ horse-power was drawn. Nearly all the power was required for moving the chain, etc., the actual power required for moving and elevating the ice being only about a quarter horse-power. This brought the power requirements easily within the capacity of the isolated electric plant that was installed only for lighting purposes.

In fact, one day when the gasoline engine did not work well, the ice plant was operated by the house lighting storage battery.

At the water end of this ice slide is hinged an apron that may be lifted out of the water for re-adjustment. It may be lifted by hand and no tackle or overhead rigging is needed. It is simply provided with a foot at the outboard end for resting on the bottom of the pond, which in this instance is rather shallow, being a surface ice pond—advantage having been taken of a natural depression in the ground at a very favorable location for the ice making.

The sections of the runway are numbered consecutively except those in the middle part of the run that are interchangeable with one another; these are all given the same number.

One of the illustrations shows the method of cutting. This small carrier at the low speed at which it runs, was able to handle as much ice as four men could cut. In fact as the carrier was so easily stopped and started it quickly became the practice to run it for a short time only when needed.

When a motor driven ice saw has been devised, which will be constructed on the plan of the electric floor surfacing machine and may be drawn or pushed about over the ice, this method of harvesting will be quite simplified and doubtless would require only two men to handle, say, one hundred to three hundred tons as might be required on any fair sized farm not equipped with an artificial refrigeration plant.

A peculiar coincidence of this interesting installation is that the relative location of the ice house, the nearness of a suitable depression for the pond, and the need for a new method at my own farm are so markedly like the conditions obtaining here that I believe the outfit would be equally serviceable if moved from one place to the other, so simple and useful is the whole scheme.

Labor-saving Devices for the Home

By Hayner H. Gordon, Ph.D., of the U. S. Patent Office

STUDY all the hunting and fighting implements from the stone-age to the present time, and you will find that each instrument of death was adopted in turn because of its labor saving character. The same holds good in all arts. It appears in the art of illumination evolved from the pine torch. Man found that with its light he could accomplish tasks at night which formerly he could do only during daylight. He thus became more efficient, and the pine torch, therefore, became a labor-saving device. And the electric light of to-day is after all a labor-saving device just as the pine torch of olden time.

The purpose of this article is to treat of a few labor-saving devices for the home. It would, of course, be impossible in any one article or a series of articles, even to touch on the great multitude of devices of this character. In connection with the home as with the world in general it should be stated that electricity is perhaps the greatest servant of all. We only have to stop and think what life would be to-day without the telephone or telegraph or the electric light. The science of electricity has had more to do in reaching the present state of civilization than all the other sciences put together.

The Electric Fireless Cooker.

The modern electric cooker or stove with its time and temperature control, apparently leaves nothing more to be done in the culinary line, unless perhaps, some horticulturist invents self-cooking vegetables. The fireless cooker, which has come into use during the last six years, is a wonderful labor-saving device for the housewife, but all the fireless cooker did was simply to utilize the heat units to the fullest extent, given to the food before being placed therein. The electric stove or cooker goes one step farther and gives the necessary heat units for cooking to the food while placed in the cooker. In brief, the electric stove consists of two heating chambers built as a unit upon the heat insulation principle. Built into the door of each chamber, is a thermometer controlling an adjustable electric switch which may be set to open at any desired temperature. This switch controls the current supply to the heating element of that chamber. In series with the chamber-controlling switches, is a master switch under control of an alarm clock, which may be set to close the switches at any desired time. With this stove the preparation of a full dinner becomes a simple matter. The prepared vegetables are placed in one compartment, the thermometer being set to boiling temperature; the meat is placed in the other compartment, that temperature being set to roasting temperature. The housewife then sets the clock to turn on the current at the proper time, and goes off to the matinee or spends the afternoon shopping with some friend. At the proper time the clock switches on the current, and the respective thermometers regulate the current, so as to supply just exactly the proper amount of heat to each compartment. Ten minutes before dinner time the compartments are opened and the food, which contains all the natural juices unaltered by gas or products of combustion, is placed upon the table. It is said that the compartments in a stove of this type are so well insulated that no more heat is radiated from them than from a sixteen candle-power electric lamp; and with the gas at a dollar per thousand cubic feet and electricity at ten cents per kilowatt hour, that the electric stove costs far less to run than the gas stove. There are a series of connecting sockets upon the top of the stove to which electric broilers and coffee percolators may be attached.

The Improved Vacuum Cleaner.

Perhaps no other device has come into such common use in the household recently, as the vacuum cleaner. The cleaners are made in two general types for the household, the first of these being the stationary type, which is generally installed in the basement of the house, and a suitable pipe line run to each floor or room where an outlet is placed. The vacuum cleaner consists of three principal parts: the dust tank, the pump, and the driving motor. In the type just mentioned, the dust tank consists of a steel tank about three feet high and a foot and one half in diameter. The air enters the top of the tank from the pipe line and passes down through a conical cheese cloth funnel to the bottom of the tank, from which it is drawn by a rotary suction pump driven by a ⅛ or ¼ horsepower motor. The dust removed by the cleaner is caught in the cheese cloth funnel and emptied out from time to time. The other type of cleaner is the portable type. This consists of much the same arrangement on a smaller scale and placed upon casters, the electric driving motor being connected by means of a flexible cord with any lamp-socket. The vacuum pumps used are of the bellows type, and consist of two boards hinged together at one end and fastened together at the edges by a leather strip, in a manner similar to the old blacksmith's bellows. One board is stationary and the other is swung back and forth by a crank driven by the motor. This type of pump is not used so much at present; more or less trouble was caused by the wearing out and cracking of the leather.

The latest type of pump consists of an impeller wheel or fan placed in a close fitting cylindrical casing and driven at high speed by the motor; the air is drawn in at the center and thrown out at the periphery. This type of pump has no wearing parts except the bearings, which are generally provided with some automatic oiling device. The vacuum cleaners are equipped with a suction hose and a variety of nozzles for different types of cleaning. The motor used in connection with the portable type of cleaners uses only a few cents worth of electricity per hour so that the cost of cleaning is low.

Hot-water Heaters.

A hot-water heater at first sight may not appear to be distinctly a labor-saving device. But when we stop to think of the days of our grandfathers when the bath tub was a luxury and all the hot water for the bath or the laundry had to be heated by means of a coal or wood fire, we can see how the time-saving, and, therefore, labor-saving idea enters into connection with the modern hot-water heating system. The newest type of hot-water heater in practical use is of the automatic type, giving unlimited hot water at any time of day or night upon the turn of the faucet. This heater consists of a long copper heating coil through which the water passes on its way to the hot-water faucet; underneath the coils is a series of gas burners operating upon the Bunsen or blue flame principle. The gas pressure is regulated by a double form of control; the pressure valve regulating the supply of gas to the burner by means of the flow of the water, and a thermostat control regulating the gas by the temperature of the water. When a hot-water faucet connected with the system is opened, the pressure upon a diaphragm is reduced and the gas is turned on; the main burner being lighted from a small pilot flame which is kept burning. The water is heated, as it runs through the coils, to a temperature corresponding to that at which the thermostat is set. It is stated that the efficiency of a heater of this type is over eighty per cent, that is to say, over eighty per cent of the total heat value in the gas is directly given to the water to raise its temperature. The ordinary tank system in which water is heated by the ordinary type of gas heater and then accumulated in the tank, with constant radiation taking place, has only thirty-five per cent efficiency. A heater of this type uses about four cubic feet of gas per minute when delivering four cubic feet per minute of hot water at a temperature of 140 deg. Fahr. This type of heater works very well in conjunction with a hot-water tank connected to a hot-water coil in the firebox of the househeating plant. The instantaneous heater is connected in the hot-water line between the tank and the house service. In cold weather, when the furnace is being used, there will be a supply of hot water in the tank. As long as this water is over 140 deg. Fahr., the thermostat control of the gas valve does not allow the same to open. If the water is cooler than 140 degrees, however, the thermostat turns on just enough gas to bring the temperature of the water up to this point.

The Household Refrigerator.

When we have such perfect automatic water heaters as have just been described, it is but natural to suppose that we have an automatic device for refrigeration for household use. One type of ammonia absorption refrigerating machine for this purpose makes use of the strong affinity of ammonia gas for water at low temperatures and of the high latent heat of vaporization of ammonia, one pound of ammonia gas absorbing 552 pounds, British thermal units, in changing from a liquid to a gas at a temperature of 4 deg. Fahr. The mode of operation is as follows: In the cylindrical tank at the side of the refrigerator is a solution of aqua ammonia, this tank is heated by either gas or electricity. Ammonia gas being driven off by the heat passes through a series of cooling coils and being cooled, liquifies in a small cylindrical chamber inside the refrigerator surrounded by brine solution. When all the gas has been driven off from the outside chamber, the source of heat is removed and cold water is allowed to flow over the walls of the outside chamber. This cools the chamber and the water again takes up its charge of ammonia gas, producing a vaporization of the liquid ammonia inside of the refrigerator, with a consequent cooling of the brine. The process is then ready to be repeated.

The control of this device is semi-automatic. When the lever at the side of the ice box is raised the source of heat is turned on. If electricity is used a switch is closed by this means. If gas is the source of energy, a valve is opened, and the burner under the tank is lighted from a pilot flame. When the tank is heated enough to drive off all the gas from the water, a thermostat releases the weight of the lever, which then falls, shutting off the source of heat and starting the flow of condensing water. We, therefore, have a definite amount of refrigeration for each lifted weight of the lever. Each operation of the device is actually equivalent to placing so many pounds of ice in the ice box. It is stated that a device of this sort is much cheaper and more efficient than the ordinary type of ice box, but it will probably be some time before we can hear the modern housewife tell the servant, to see if the ice box is lighted, without feeling that something is wrong.

Labor-saving Cleaning Machinery.

With the four labor-saving devices just described, the work of the housewife has been lessened to a great degree, but the multitude of smaller devices have contributed much more to making the life of the housewife easier. The routine housework of the week in the modern up-to-date home has been much simplified. On Monday, the washing is done in a patent washing machine run either by electricity or a small water motor. The clothes are then wrung out in a motor-driven wringer.

Tuesday, the ironing is done not as it used to be with a hot fire in the stove and the sweltering heat of the kitchen laundry, but with cool gas or electric irons. There are also small gas mangles for ironing such things as collars and cuffs at home, so that the modern housewife is no longer dependent upon the steam laundry.

Wednesday, is mending day and the housewife, of course, brings into use the sewing machine, but the sewing machine of to-day is different from that of yesterday; for now it is driven by a small electric motor, the speed of which is regulated by the pressure of the foot and the full set of attachments for the darning of stockings, working button holes, braiding, and embroidering may be used with a machine.

Thursday, is calling or matinee day.

Friday, the vacuum cleaner comes into use, together with the dustless dust cloths which are just beginning to appear. The silverware is also polished by means of a small electric motor.

Saturday, is baking day, and the new aluminium cooking and baking utensils are used in conjunction with the gas or electric stove.

Then follows Sunday, the day of rest.

The End of the Oldest Newspaper in the World

THE president of the Chinese Republic, Yuan Schi Kai, recently suppressed the newspaper King-Bao, which undoubtedly was the oldest paper in the world. For 1,500 years it has reported the more important news not only of China, but also of foreign countries. At a time when the art of printing and journalism was as yet unknown in Europe, the Chinese Gong-Chung invented a means for making types from lead and silver, and in the year 400 A. D. the paper King-Bao was printed, and has since been issued regularly until recently. The first edition was printed on ten sheets of yellow silk, neatly tied together, and was thus sent to all the high officials of the Chinese Empire.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

A New Method of Working Controls to Escape Accident in a Spiral Dive

To the Editor of the SCIENTIFIC AMERICAN:

I have read with considerable interest the letter of T. P. Brooke, as well as the editorial inspired by the same, in a recent issue of the SCIENTIFIC AMERICAN.

While gyroscopic force is a danger not generally recognized by aeroplane pilots using Gnome motors, I do not believe that it was that force which caused Paul Peck's fatal accident. Spiraling to earth in small circles was a feat that Peck frequently indulged in, and it is doubtful if any other American aviator was more proficient at this than he.

Once, at Mineola, the writer saw him drop fifteen hundred feet while describing but three circles of about one hundred feet radius, and then suddenly straighten out when only fifty feet from the ground, and land perfectly. Many times he had been warned against this spectacular flying, but he delighted in it, and claimed that, while spiraling, there was absolutely no danger of his losing control of his machine.

As practically all of his flying had been done with a Gyro revolving-cylinder motor, surely Peck would have noticed it if any gyroscopic force had manifested itself at any time during any of the many spiral descents which he made. As a matter of fact, the only time at which this force acts to a dangerous degree, is when an aeroplane moving in a straight or curved course is suddenly twisted about to right or to left. This sudden deviation from its course need be through only two or three degrees, but it instantly reacts, causing the machine to turn upward or downward with such suddenness that, in the latter case, the aviator is flung from the machine like a stone from a sling. John B. Moisant at New Orleans, and W. A. P. Willard (Miss Quimby's passenger) at Boston, are examples of this action. A sudden twist may be given the aeroplane in several ways, such as the pilot's foot slipping off of the tiller, or the breaking of a control wire, or upon entering an "air hole" or pocket. Under these conditions, for the moment, the pilot is perfectly helpless, but if he is securely strapped in his seat, he has a chance of recovery. With the 100 horse-power, 14-cylinder, revolving motors that are now being used, the reaction may be so intense as to break the fuselage in two.

Mr. Brooke's idea that, as the result of a sudden dip of Peck's aeroplane, gyroscopic force caused the aeroplane to tip to one side and spiral, is entirely erroneous. The converse of the action mentioned above by me is that a sudden dip would turn the machine to the right or to the left; but there is no way in which it could be tipped to one side or the other, and caused to spiral by the gyroscopic force.

In all probability the true explanation of Paul Peck's accident is that he passed the limit of safety in both turning and banking, while making one of his famous spiral dives, and was unable to straighten out his machine again before he struck the ground.

Recently, in *Flight*, Lieut. Parke, of England, described how he and a companion, while doing a spiral dive, found the banking becoming steeper and steeper and the dive ever more abrupt. Despite the warping of the wings to the limit to stop the tipping, and the turning of the rudder inward toward the center of the circle, and of the elevator upward to make the machine rise, movements customarily made when spiraling, the machine was evidently completely out of his control and both men believed themselves doomed. When about fifty feet from the earth, Lieut. Parke accidentally turned his vertical rudder in the opposite direction, outward instead of inward, and instantly his biplane came out of the spiral and sailed off on a level keel. Mr. Brooke's three witnesses who saw Peck's rudder turned outward, would indicate that this young flyer had heard of, and did apply Lieut. Parke's remedy for an uncontrolled spiral. But if it worked in one case, why did it not work in the other? The reason no aviator saw the rudder turned outward may be that the rudder was not so turned. It is well nigh impossible to determine, except by a photograph, how the rudder and elevator are set on a fast spiraling aeroplane. Further proof that Peck did not turn his rudder outward is the fact that Roland Garros has found that in spiraling with a Blériot monoplane, it is necessary to turn the rudder outward and the elevator downward in order to recover. With Garros and Lieut. Parke in agreement on the movements of the controls necessary to be made in this emergency, it seems practically certain that young Peck did not make these movements, or at least that if he did make them, he did not make them in time to prevent his destruction.

Finally, gyroscopic force should not be used to explain accidents in which it cannot possibly have acted.

New York. STANLEY Y. BEACH.

Determinism v. Freewill

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 31st C. H. K. quotes Dr. Johnson as saying: "Sir, we know our will is free and there's an end on't; all theory is against the freedom of the will, all experience for it."

That was just like the good old Doctor, but would it not have been about as logical for him to have said: "Sir, we know the sun goes around the earth and there's an end on't; all theory is against the old belief, all experience for it?"

Let us first get clear on this supposed antagonism of Theory and Experience. In a strict and scientific sense experience represents the source of all our knowledge and the foundation of all truth, and when a theory is shown to be at variance with experience it is abandoned or modified, but in the general use of the word experience may be said to be also the source of all our errors and illusions. It often happens that theory is true and that experience, so called, is false or misleading. When a theory is a logical deduction from a proven law, then the "experience" which is contradictory stands for correction, because it really conflicts with the vast and verified experience upon which the said law is based.

This apparent paradox is of course due to our confusion of experience and inference. For instance, the destruction of matter was a daily "experience" until science proved it an impossibility. Now we understand that only the disappearance of matter was the real experience, destruction was an incorrect but common inference.

This act of discriminating between our actual experience and what is really inference is not always easy, but it becomes a habit with the philosopher; it is a distinguishing trait of the scientific mind, and it is a mental exercise that is much more commendable than it is common.

Now the Determinist takes the position that his doctrine is an exact logical deduction from an established law, namely, the Persistence of Force, or the law of Cause and Effect, as most of us call it, the most fundamental of all our accepted generalizations; therefore, if he is correct, it accords with universal experience; and he points out, as I believe Schopenhauer suggested, that the apparent freedom of the will is an illusion due to our consciousness of the emotional processes which result in decision and action—a self-consciousness which is, at most, very superficial.

The Determinist further argues that his doctrine accords more directly with experience. People act in the same way under the same circumstances, or, when they do not, we say that some are "differently constituted," which is only saying that the circumstances are different. Otherwise there could be no social order. Political, commercial, and financial systems are evidences for Determinism.

Freewill would be psychical Chaos. It is, in fact, unthinkable, Determinism is at least conceivable. It is recognized in our laws and customs. It pervades our every-day speech. "We do as we *will*, that is as we *wish*," yes, in fact we do nothing else. When we act, as we say, contrary to our desire, we mean only that a greater or higher desire than any which first swayed our minds is acting within us. We expect no heroism from one who has not "got it in him." If we are sometimes surprised and proven to be wrong, we admit our mistake and apologize. We can conceive of no sane person doing anything without a reasonable *motive*. The entire absence of reasonable *motive* is accepted by us as *prima facie* evidence of insanity—and there we are still acknowledging Determinism.

Will, in practice, may be said to be the algebraic sum of the various desires involved. Action, inaction, or adverse action follow as the resultant "sign" is positive, neutral, or negative.

It is not necessary that we explain all the strange aberrations of the individual mind or the many seemingly unaccountable acts of men, any more than it is required of us that we explain in detail the interminably varied and involved movements of a running brook in order to substantiate the law of the Persistence of Force or Continuity of Motion in the physical world.

There is one question which the advocate of Freewill will immediately ask, with the air of making a poser for the Determinist; "What about moral responsibility? There could be no moral responsibility according to the deterministic postulate, therefore our system of administration of justice is all wrong. Why do we punish the wrongdoer?" The answer is so obvious that it seems awful to have to repeat it: We are only doing the best we can. We are following our hereditary impulses, the instincts which so far have served very well, considering, and we must continue to follow them until we can do better.

As we grow in knowledge we will substitute a more scientific method than that of stimulating fear in order to deter men from vice and crime, a crude and unsatisfactory method at best. As we become more scientific, our administration of justice will merge into a prevention of injustice. Our corrective methods for social evils will become more rational and more efficient, and nothing is doing more to prepare men's minds for the acceptance of this much-to-be-desired social plan than the spread of the doctrine of Determinism. It underlies every real advance made in educational methods and the spread of social welfare.

To paraphrase Prof. Jacques Loeb in a recent article in the *Popular Science Monthly* upon the mechanistic as compared with the vitalistic conception of life: When even the advocate of Freewill wishes to contribute anything more valuable to us than mere argument or rhetoric, he proceeds upon the assumption of Determinism.

Where the adherent of the doctrine of Freewill in practice has neglected or ignored the facts, trusted to chance or Providence, exiled, persecuted, maimed, and murdered the children of men—and failed—the Determinist in practice will study the facts, readjust conditions, forestall degeneration, nourish, train, and succeed.

Determinism is only one phase of that simple Faith which grows stronger with every advance in knowledge and which is the guide and inspiration of the scientific investigator in every field—the belief in the Uniformity of Nature. J. E. STINSON.

Wichita, Kan.

The Rail Problem

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 10th, 1912, I read that a Public Service Commission has pronounced excessive speed as the cause of broken rails on our railroads.

It looks very much like an acknowledgment of defeat on the part of our engineering experts, if this failure cannot be prevented except by reducing speeds—a means of last resort.

Is it not possible that they have been looking for the fault in the wrong place? This fault may be in the rails, the roadbed or the rolling-stock. The first two places have been probed, and many faults found and corrected, but still the rails continue to break. But, as regards the rolling-stock, I do not believe that a single change has been made or suggested, with a particular view to prevent the failure in question.

Reducing the weight of the rolling-stock would also be an acknowledgment of defeat by engineers and inventors, and should not be considered so early in the game.

If attention be directed to the rolling-stock, it is at once noticed that the load of the train is very unevenly distributed over the rails, through the medium of the trucks or wheels. The load should be so distributed that the rails, when once loaded, would not be relieved until the last pair of wheels of the train had passed.

Under the present manner of distribution, the rails are alternately loaded and unloaded, as the wheels pass over—once fully or twice partially—in the passage of each individual car in the train. This involves repeated bending of the rail, which must tax the fastenings, and ultimately cause a weakening and breaking of the rail, because of crystallization.

To carry out this suggested change, it would be necessary to build shorter cars and increase the wheelbase of the trucks. Instead of shorter cars, however, an additional truck could be provided, which would be placed midway between those as they are at present, disposed at either end of the car. To provide for rounding curves, the flanges could be left off these additional wheels or provision made for lateral movement.

With this reconstruction, the individual pairs of wheels throughout the entire train would be equally spaced and a perfectly uniform distribution of the load obtained; and instead of subjecting the rails to repeated shocks, during the passage of a long train, this would be reduced to unity—or the fluctuations rendered so light as to be harmless.

Chicago, Ill. C. W. EISENMANN.

A Plan for Utilizing the Sahara Desert

To the Editor of the SCIENTIFIC AMERICAN:

I was very much interested in your recent article, "Converting the Sahara Desert into a Sea," and from the description given of the engineering features, it seems to a "rank outsider" that instead of making a great inland sea it would be far better to make a series of irrigation and navigable canals and possibly small lakes in low areas in which the quantity of water could be regulated to a nicety by gates or locks in the intake canal, as well as with others along the line where needed.

This would not cover up hundreds of thousands of acres of the best and most fertile land, and the smaller quantity of water would not disturb the "earth's equilibrium" nor be a danger of making climatic changes in Europe, both of which were mentioned as objections to the "Inland Sea" plan.

Wheeling, W. Va. W. P. MEGRAIL, M.D.

Labor-saving Duplicating Machines for the Office

A Review of Methods Old and New

By H. S. McCormack

The requirements of business have made it necessary to devise quick, cheap and successful processes for duplicating handwriting and typewriting. In the last twenty-five years the number of duplicating devices has multiplied until it would seem that every need of the office is supplied. And yet duplication in a business sense is still in its infancy.. Much remains still to be done. The following article, written by a well-known expert on business efficiency and office management, describes briefly the principal duplicating machines now in use. As a review of the state of the art, his article may suggest to others improvements which are still needed.—EDITOR.

ASK a dozen business men what in their opinion is the best duplicating machine on the market and you will probably receive a dozen different replies. Each business man is invariably guided by his own experience. If the man to whom that question be put happens to be a railroad man, he may recommend the mud duplicator, because in his department the duplicator he recommends is possibly the best of all.

The "mud duplicator" is known to the trade by the more refined name of the "clay process," and is furnished usually in metal trays, but in some of the steel mills and railroad offices the "mud" or "clay," as it is called, is purchased in bulk, usually in kegs.

When purchased in bulk the clay is spread out on tables to the thickness of one half or three quarters of an inch, the table being fitted with an inch beading around the edge, but it must be understood that in most such "copying offices" good clothes are unknown.

This clay material resembles putty to some extent and has about the same consistency, while the color is not unlike that of putty.

How the "Mud" Duplicator Works.

After being spread out on the flat surface a wet sponge is used to moisten the clay; after which the sheet to be copied is applied, face down, to the clay. The document to be copied or duplicated has previously been prepared with either duplicating ink or a duplicating ribbon; consequently, when the document is laid flat and rubbed gently down on the smooth surface for the purpose of eliminating wrinkles and air spaces, the damp clay receives the impression.

The paper is left for a minute or two and is then pulled off. Upon the surface of the drab colored clay is the inked formation of the work to be duplicated.

Immediately after the original copy has been removed, fresh plain sheets are applied quickly and smoothed out, usually by hand, and are immediately pulled off. Thus a few good legible copies are secured. Now the moistened sponge is brought into play, and all trace of the copy is washed off and a new copy is stamped on immediately and the operation repeated.

For securing from three to six or eight copies of a shop order or for securing copies of way-bills, etc., the clay process has the advantage of being inexpensive and very rapid and, although an old process, there has been nothing found that would quite take its place for quick and inexpensive results.

The Gelatine Pad.

Following the "clay process" came the "gelatine pad," or the little tin trays or jelly cake tins in which was poured a gelatine composition, which was a very clean and refined method for securing a few duplicate copies. A great many companies sprang into existence and began to furnish gelatine copying pads, with the result that thousands of gelatine tins were sold to business firms all over the country, but the best known process was the old "hektograph," which is still in existence. Despite the wonderful strides made in the art of duplicating, there remains to-day a certain demand for duplicating work of this character.

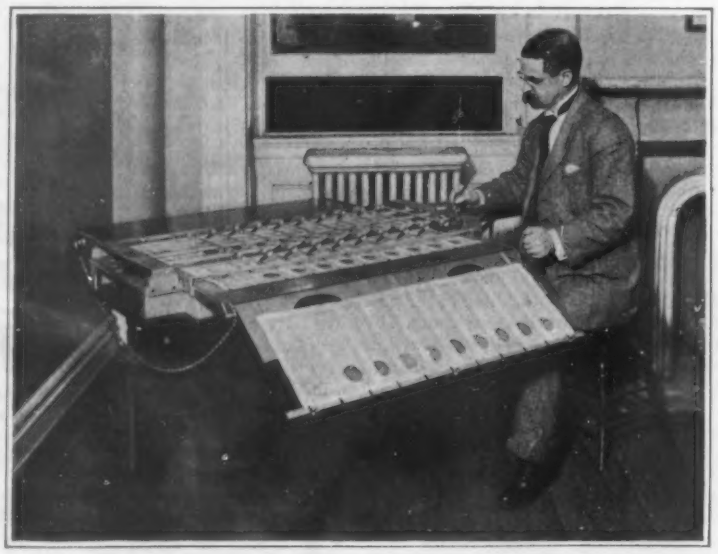
Then came the typewriter, followed by typewriter carbon copies. The results of the first carbon sheets were anything but satisfactory, and it is hard to-day to realize how mussy and smudgy were the carbon sheets at the time the first typewriters were introduced. Soon improvements were made in the carbon paper. Then came the hektograph typewriter ribbon, which smeared up the operator, the office boy, and sometimes ruined the disposition of the "boss." Finally the art of manufacturing the proper ribbons was learned with quite satisfactory results.

About this time the hektograph carbon was introduced, and while the number of legible copies was reduced, the cleanliness of the carbon, as compared to the ribbon, was an element in its favor.

Next came the wax stencil sheet. In this connection the history of A. B. Dick, who was engaged in the lumber business at the time, is interesting in itself, as he was the pioneer user of the wax principle, and his highly perfected wax sheet and ink supplies will go down in history, now that the Dick-Henry case has stirred up the country and the press, and seems likely to result in some far-reaching legislation.

With the mimeograph copies are produced in large numbers of such a character that they can be successfully used for circularizing.

An inventor has designed this machine to provide a mechanical means of setting up type faces. The printing mechanism is equipped with a roll of paper which is cut off in suitable lengths when the machine is operated.



This machine duplicates a signature many times. Without it the new stock issues of dissolved trusts could not have been issued within the allotted time.

How the Wax Stencil Sheet Duplicates.

The stencil, as now used in the process of duplicating autographic work, is made on a sheet of fine, specially manufactured tissue paper coated on one side with a film of wax or very sensitive material.

The cutting agent of the mimeograph is a plate of fine tool steel upon which are cut intersecting corrugations numbering two hundred to the inch, thus making on the plate a surface of small sharp points, so fine and minute that a magnifying glass is required to bring them distinctly to the eye.

Upon this steel plate (which is embedded in a table of polished slate) the sheet of sensitive paper is placed, and the stencil is formed by writing on the paper over the steel plate with a fine-pointed stylus which is made of tempered steel. As this stylus passes over the sensitive paper, it presses it against and upon the steel plate, and the fine sharp points puncture it from the under side, making a series of orifices or holes, each one a two hundredth part of an inch from the next, in the lines of the writing. The point of the stylus, although tapered to the size of a nicely sharpened lead pencil, really rests on three of the cutting points of the writing plate at one time. It thus glides easily and smoothly over the roughened surface without tearing the paper, but still with just enough friction to make the act of writing a pleasant operation, almost identical with that done by a medium hard lead pencil.

With the advent of typewriters, experiments were first made with sand-paper behind the wax sheet, and then emery cloth; but the attempts were very unsatisfactory until the present method was discovered, i. e., the use of a sheet of specially prepared stencil paper (made from open woven Japanese fiber similar to a lady's veil), back of which is placed a piece of very fine bolting cloth or open fibrous paper, both being inserted in the typewriter and written upon in the same way as an ordinary letter is produced, with the exception that no ribbon whatsoever is used.

The stencil is made by striking the type against the stencil sheet, and in doing this the wax coating is driven from the stencil sheet into the bolting cloth or fibrous backing in the lines of the characters so struck; in other words, the typewritten stencil is made by removing the wax coating from an open fibrous material where the type has struck.

The mimeograph was the first duplicating system which produced copies in sufficient numbers of a grade which gave them a commercial value for circularizing purposes.

While the mimeograph was going through its early stages of development there was brought from the other side a gelatine roll of German manufacture

The gelatine was in thin layers, pressed upon oiled boards; this method of applying the gelatine had many advantages over the hektograph pans, inasmuch as when its plates were used on a gelatine roll it could be rolled along and fresh space exposed, whereas, with the tin tray, the material could not be used again for twenty-four hours, or until the gelatine had absorbed all the ink.

The old-fashioned copypress had, with the advent of the typewriter, become more popular than ever. Now came a demand for the big presses. The railroads used large sheets of tissue and secured a dozen copies at a time, but there was a demand for a larger number of copies and for better copies, with the result that numerous inventors were striving to supply the need.

The Typewriter Duplicator.

Finally, the type duplicator was introduced. This was really a portable printing press composed of a flat bed with a roll or platen running over the printers' chase, which was filled with the regular standard printers' type. The advantage of the outfit was mainly that it was equipped with a typewriter ribbon; consequently, the impression secured was a good imitation of typewriter work.

This attempt at duplication was followed by type lined up in cylinders, or metal drums, and these little types, with their different faces, were in grooved channels opposite a revolving typeholder, which permitted the type from the supply drum to be set up in letter form. When a letter form was completed a ribbon was stretched over the whole and the handle turned, with the result that duplicate letters were turned out in wholesale quantities.

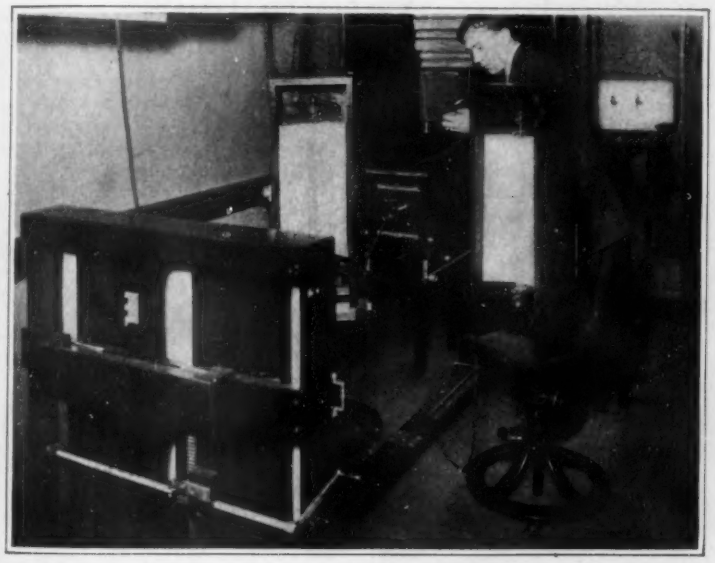
A flat-bed type of duplicator using foundry type, electros, etc., of standard size. These machines provide means for duplicating typewritten letters or for printing forms in business offices.

Then came a demand for a fewer number of copies—one copy of a document or instrument—in some cases, two copies. This was especially desired by insurance companies where it was customary to copy original insurance applications by hand. Insurance companies found it necessary to copy insurance applications for use in adjusting or contesting cases, but the system of copying by hand was cumbersome, full of delays and expensive, while the errors in copying resulted ofttimes in considerable loss.

Making Duplicates by Photography.

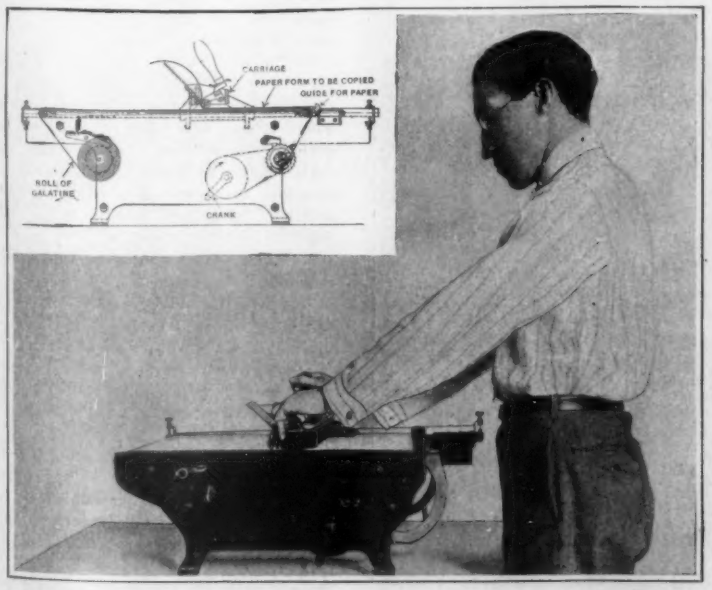
This demand brought about a photographic method, or a self-contained photographing outfit, which reduced the cost of copying by hand and produced in a few minutes, instead of a few hours, a true copy of the original papers.

(*Concluded on page 310.*)

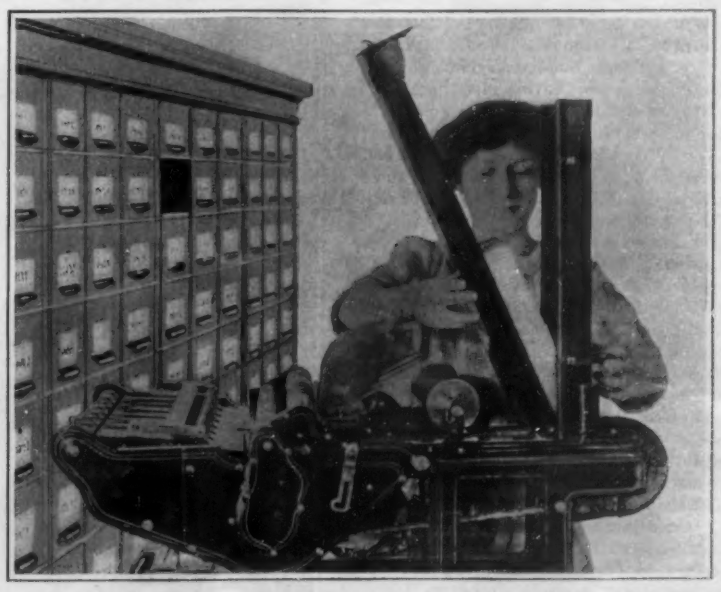


This remarkable photographic device delivers within a few minutes a duplicate of a design or drawing. It photographically reproduces a piece of machinery or a sample cartoon or supplies a photograph of a new lace curtain. Libraries use it extensively for copying whole pages of books to save readers the trouble of transcribing.

The multigraph is an instrument which duplicates by means of type lined up in cylinders or metal drums, which little types, with their different faces, lie in grooved channels opposite a revolving type holder. A ribbon is stretched across the completed letter form, a handle is turned, and duplicate letters are turned out in large quantities.



A duplicator that makes from one to seventy-five copies from one master sheet.—The machine itself consists of a rigid frame supporting a flat steel bed, over which travels a sheet of highly absorbent gelatine. By means of a feeding carriage the original or master sheet is brought in contact with the gelatine band, which takes an exact impression of the written matter; then by feeding blank sheets in the same manner, copies are produced. After one portion of the 14-foot band is used, a new surface is obtained by turning a handle which automatically winds up the used surface as well.



A combination letter-writing and addressing machine.—The machine automatically produces complete typewritten letters, each with a different name and address—together with the proper salutation—in one operation. The complete letter is printed through a single ribbon—so that the "match" is absolutely perfect. The machine can be equipped with an automatic skip attachment permitting the skipping or printing of any combination of lists up to eight classifications. Both segments and address plates are set up by means of a rapid automatic typesetter.

Fig. 1.—Drilling thirty-two holes simultaneously.

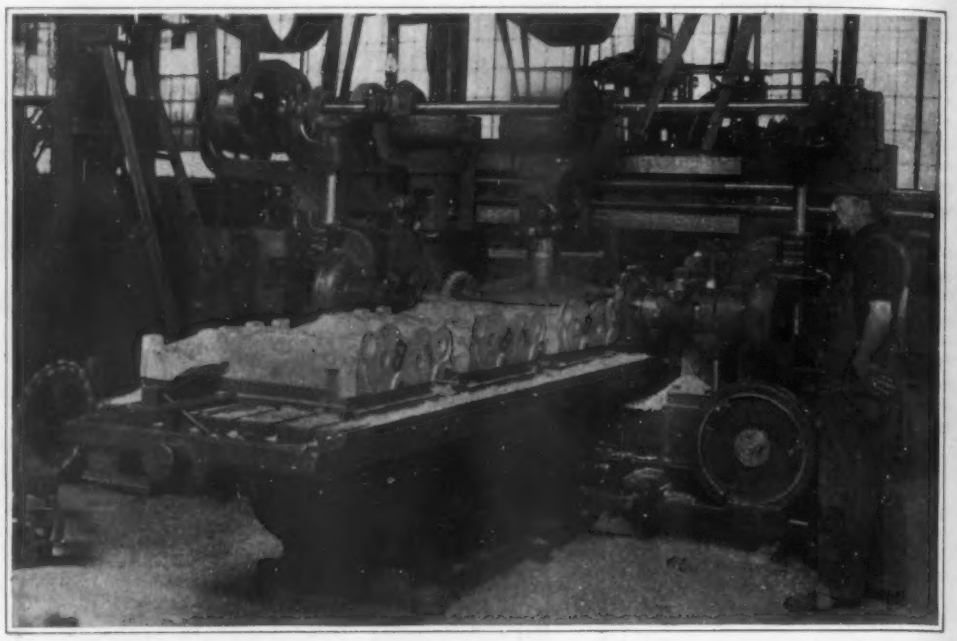


Fig. 2.—Four crankcases are machined in a single movement of the bed on which they rest.

Labor-saving Devices That Produce Automobiles

Multiple Production and Its Influence on Automobile Prices

By Theodore M. R. von Keler

THE first step in sending the automobile-to-be on its winding path through furnaces, lathes, drills and stamping machines naturally is the purchase of materials. This work is handled by the purchasing department, where a system of records is kept which allows instant determination of the exact time when the parts or materials ordered are due to arrive at the factory. If there is any hitch in the shipping from the manufacturers of raw materials, "chasers" are sent to them and things are "hustled" along. A "chaser" is a man whose sole duty it is to take hurried railroad trips to the tarrying establishments and to impress upon their managers in as forcible a manner as possible the necessity of "getting a move on."

The steel ingots, sheets, wood wheels, "live" axles, ball and roller bearings and all the other thousand-and-one large and small bits of metal and wood having been received, the future automobile begins to rise out of the chaos, not in a single unit, but in lots of a thousand or more. At one end of the huge factory an immense drop forge gives a few "loving taps" to an unwieldy steel bar, and lo! a side frame member of the chassis is born. Another forge close by, at the same time, turns out end members, and before you realize it, there are a dozen or more complete chassis frames standing alongside of you.

A little farther down the line of huge machines there stands a big forge which by a single blow turns out a front axle for the car-to-be, the steel bar, of course, having been treated before it reached the machining shop. And so on and on. Everywhere stand whole batteries of machines which do nothing all day long but strike a terrific blow every minute or so, or which lift a part to be machined against a multiple drill, the man in charge being so expert in his particular duties that he barely casts a glance on his work now and then. The machines work automatically and with the least amount of energy to the attending operator.

Take for instance the multiple drilling machine shown in Fig. 1. In a single upward movement of the table on which the crankcase rests, thirty-two holes are drilled simultaneously in less time than it takes to drill a single hole in an ordinary machine from a center punch mark. The casting itself is held securely in a special jig, in such a position as to force the drills to pass between steel bushings spaced with absolute accuracy. The operation of drilling the thirty-two holes, besides requiring only 1/32 the cost and time of machine shop methods, is far more accurate.

Fig. 3.—How crank cases are bored for cam-shaft bearings. Accurate alinement is secured by means of a jig.

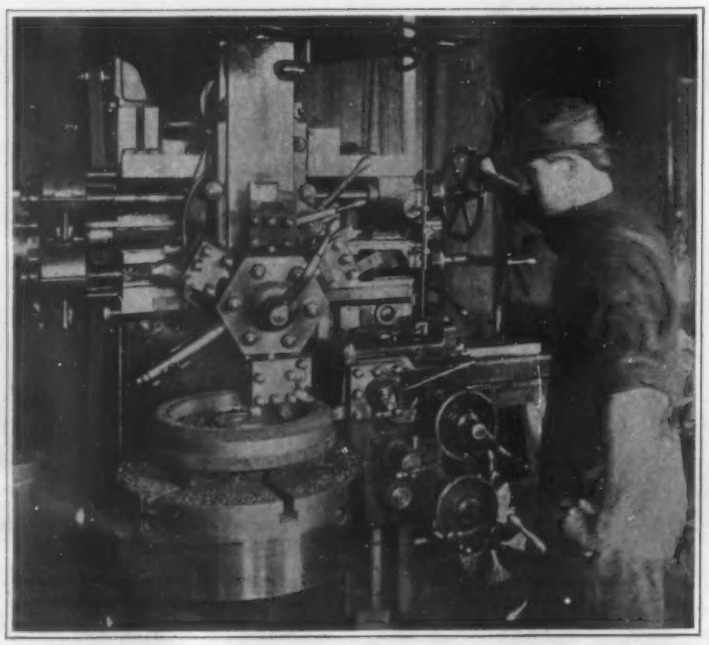


Fig. 4.—A set of four cutting tools works simultaneously on a flywheel. By a single movement the operator can bring into use other sets of tools, ready clamped in the pivoted arm, the entire operation of finishing a flywheel taking but a few minutes.

Similar drilling machines drive holes through the frame members and transmission cases, in sizes varying from 1/8 of an inch to 6 inches diameter. All of them are automatic or semi-automatic and are accurate to the 1/1000 part of an inch.

A little farther on one sees a huge machine which at one time performs three operations on ten different sets of cylinders. The milling on this machine is the first operation on the rough cylinder castings, as they come from the foundry. Another big machine, shown in Fig. 2, illustrates how four crankcases are machined in a single movement of the bed on which they rest, while Fig. 3 shows how the crankcases are bored for camshaft bearings and how accurate alinement is secured by means of a jig.

One is involuntarily reminded of a cannery in which fruit is canned, when one sees the huge "paring" machines at work. There is one that silently, and yet irresistibly, shaves steel from a rough camshaft forging as easily as one would pare an apple, and nearly all of them work with so-called "gang jigs," that is to say, they machine several pieces at one and the same time. An example of this kind of machine is shown in Fig. 4, where a set of four cutting tools starts work simultaneously on a flywheel. By a single motion of the operator's hand other sets of tools, ready clamped in the pivoted arm, can be brought into use, the entire operation of finishing a flywheel taking but a few minutes.

Far more complicated, and therefore more interesting, are the gear-cutting machines which turn out the finely beveled gears for the transmission and driving gears. From a solid chunk of steel fed into them they cut with more than human accuracy the finished bevel gear.

A machine of a different kind may be seen at one end of the big plant. It is an electric welding machine, and truly is as near being magical as a machine can be. The fender irons, being sharply curved, offer considerable difficulty to a drop forging in a single operation. They are therefore drop forged in three pieces

and these three pieces are placed in the welding machine. In ten seconds the three cold pieces of steel have been heated to white heat, connected and come out in a single piece, which by actual test is stronger than a similar piece would be, if drop forged as a unit.

Passing from the big hall into one of the smaller assembling rooms, one notices a man who appears to be playing with a huge spinning top. But his is an important duty, even if it does look as if he were but playing. He is the flywheel tester. The finished flywheel is loosely hung upon the top of a rapidly revolving shaft. As the machine rotates, the flywheel spins upon its exact center, and the centrifugal force causes the heavier parts to swing outward. A piece of chalk is held against the revolving wheel, and if heavy marks are visible, the rim is drilled until it is in perfect balance.

But important as the mere manufacturing of the various parts is, it is useless to turn out completely finished parts in a few minutes at but a single operation unless these parts are perfectly made. And while the milling, drilling and cutting machines are wonderfully accurate, the motor car builder of to-day takes no chances with their infallibility. In another room, adjoining the big machining department, he has machines which like nothing better than to find fault with the work of their big brethren. There are, for instance, gages and balances for testing cylinders and pistons, which reject automatically any and every piston found defective or light, be the imperfection ever so slight. A piston weighing but a few grains more than its "partners" in a four- or six-cylinder motor may seriously interfere with the smooth working of the engine

There are still more accurate gages used for testing ball and roller bearings. So difficult is the production of these that the bulk of it is carried on in special factories equipped with the most marvelous testing instruments known. One of these is shown in Fig. 7, and is used for gaging the size and weight of rollers used in roller bearings. The rollers are fed into a horizontal cylinder from which they are sent on an endless belt between the poles of electric testers. When they pass one in which they meet all the requirements as to thickness and weight, contact is established, a trap door opens and they drop into a receptacle placed below that particular tester. The cans shown below hold rollers of certain sizes and weight, there being sixteen of them on each testing machine.

In another machine the hardness of the steel used in wrist pins and other important small parts of the car is tested. This machine is a scleroscope. It consists of a graduated glass tube through which a hard steel ball is dropped upon the steel to be tested. The ball hits the steel and bounces back into the tube. As it is always dropped from the same height, the degree of its bounce indicates the hardness of the steel.

Crankshafts are placed upon knife-like edges and turned at every possible angle. They must remain stationary in any position. If they move the least fraction of an inch, they are rejected as imperfect and out of balance. The men who do the testing are experts in their line. Supersensitive ears added to highly developed powers of observation enable them to discover imperfections in a motor which the layman could not notice, even after they are pointed out to him. There are men who do one particular operation day in and day out, who repeat it a thousand times a day, and perhaps a million times in all before they are promoted to some foreman position. They are specialists in the highest sense of the word.

But all the efforts of the factory, and the very core of the so much desired multiple production, as explained before, would be wasted were it not for the highly organized distributing and selling organization. It is one thing to design a machine which will handle a given number of operations at a single turn of a wheel, but it is quite another thing to so adjust the remainder of the factory and the sales end of the enterprise, to take full advantage of the efficiency of the machinery. The human factor in such an organization is still too large to be ignored, and the administration and selling end of the same are fully as interesting than the mere mechanical production.

Fig. 5.—A single day's output of motors used in one of the cheapest cars on the market. In order that the consumer may receive a motor that is as perfect as mechanism can make it, it is subjected to the tests of gages and balances which reject automatically any and every piston found defective or light, be the imperfection ever so slight.

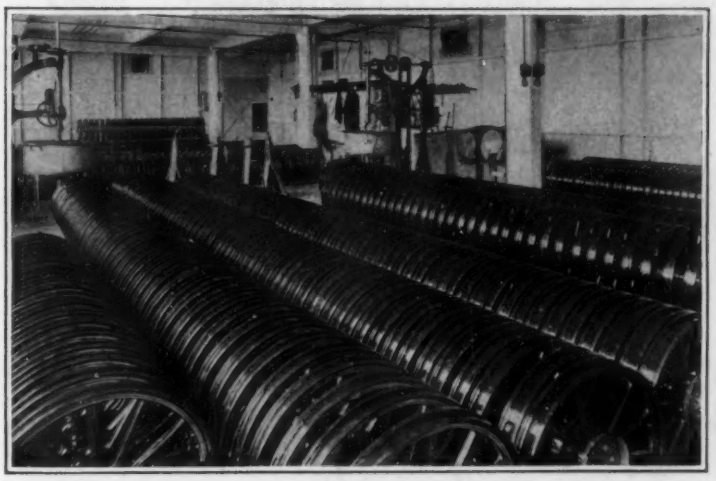


Fig. 6.—This is about one quarter of a day's output in wheels for a Detroit manufacturing firm. Like other parts of an automobile, wheels are not only made by the thousand, but are carefully inspected and tested before they are fitted to the axles of the cars which they are intended to support.

Fig. 7.—Testing roller bearings for accuracy in electrical testing machine. The rollers are assorted by the machine, and those of exactly the same size are dropped into one can. There are sixteen cans for sixteen different sizes, varying from one another by only 1/256 of an inch. The largest and smallest sizes vary by only 1/16 of an inch.

Chill-proof Beer

NO subject has engaged the efforts of the brewers in recent years more than the problem of brewing a chill-proof bottle beer that will stay brilliant and retain its original flavor and taste when chilled to low temperatures. Beer is very sensitive, even diffused daylight affecting its taste and color unfavorably. Pasteurization, while preventing any further fermentation, exerts a detrimental influence on the beer and increases its sensitiveness. Not only light, but also low temperatures affect the beer injuriously. Bottled beer deteriorates in time. If, after ten days to two months, the bottles are chilled by placing them on ice, their contents become hazy or cloudy.

Beer contains from 2.5 to 8 per cent of alcohol, 3 to 6 per cent of carbonic acid gas, and from 6 to 10 per cent extract, including about 0.4 per cent of albuminoids. It was found that the turbidity of the beer was due to a part of these albuminoids, which, on chilling, became insoluble. These albuminoids are of a highly complex molecular constitution, and the sensitiveness of the beer is due to their presence. Bottles made of brown glass protect the beer from the actinic rays of light, but do not prevent haziness on chilling. It may be supposed that the problem was easy of solution by chilling beer almost to the freezing point and filtering. However, it seems that the albuminoids of the beer constantly undergo slight changes, and beer, carefully filtered when cold, will again become cloudy when subjected to chilling a second time.

The problem was attacked from many sides. Efforts were made to modify the albuminoids in the mash tub; by removing as much as possible the albuminoids of the beer; by restricting their introduction in the mash tub. However, since malt contains soluble albuminoids which enter the beer wort, the evil could not entirely be overcome. Furthermore, beer containing few albuminoids deviates from the composition of normal beer; the foam keeping qualities are impaired and it lacks what the brewer calls zest and palatefulness. Neither were special methods of fermentation of any avail.

At last the problem has been successfully solved; bottled beer is now put on the market which stays perfectly clear and brilliant even after staying on ice for days and weeks.

The solution consists in rendering the albuminoids permanently soluble, in digesting them, as it were, by breaking down the highly molecular albuminoids into lower albuminous compounds, such as albumose, peptones, and amino acids. This is done by adding to the beer a minute quantity of a proteolytic enzym, as little as one gramme per barrel of beer being sufficient. Enzyms are organic ferments; they are nitrogenous compounds of complex structure, which by their mere presence are able to effect chemical changes in organic substances without undergoing any change themselves; in other words, they are catalyzers. The study of enzyms is extremely difficult. Enzyms usually occur in mixtures with other enzyms, and it is practically impossible to separate them without decomposition. Boiling, or even lower temperatures, will coagulate them; the presence of traces of certain salts, etc., will inhibit their action, while other salts will energize them. Malt and yeast contain a large number of enzyms, one of which is peptose, a proteolytic enzym, capable of dissolving and modifying albuminoids. In employing enzyms derived from malt or yeast, no substance is introduced into the beer except those derived from the usual brewing materials.

The Imposing Naval Review at New York

The President Reviews Five Miles of United States Warships

THE grand mobilization of the Atlantic Fleet at New York for inspection by the Secretary of the Navy and review by the President of the United States, is the largest and most important gathering in one place of the ships of the United States Navy that has ever occurred. Last year ninety ships were mobilized at New York whose total tonnage reached 576,634. To-day there are gathered in the Hudson River 123 ships of all classes, whose aggregate displacement is 720,486 tons. That the people of New York and visitors from the various States will thus have under their eyes, at one and the same time, practically the whole fighting force of the United States Navy, is shown by the fact that the latest official summary of the displacement of all the ships of the United States Navy gives the total as 758,499 tons. So that the fleet at New York is only about 38,000 tons short of including the whole of the effective Navy.

The five-mile line of ships will extend from Thirtieth Street to a point about a mile and a half above Spuyten Duyvil, at the mouth of the Harlem River. The fleet includes:

	Tons Displacement
31 Battleships	478,508
4 Armored Cruisers	58,000
4 Cruisers	15,563
20 Special Type	55,373
6 Naval Militia Vessels	4,581
8 Fuel Ships	88,385
24 Destroyers	16,947
16 Torpedo Boats	3,029
10 Submarines	....

The object of the mobilization and review is two-fold. First: It is the hope of the Navy Department that the gathering of so many ships of various types will stimulate the interest of the public in the Navy, and that it will give the many thousands of visitors who will go aboard the ships that more intimate and intelligent knowledge of the quality of our Navy, which can be obtained only by a personal inspection of the vessels themselves. Printed descriptions and published photographs can do much in the way of instruction; but far more can be effected by gathering the fleet in one great assemblage, and giving the public every facility to inspect the ships in person. That these reviews fulfill this purpose was proved last year, when it was estimated that many millions of people, not only from New York but from far distant sections of the country, flocked to the banks of the Hudson River to witness the imposing spectacle, and crowded the excursion boats, which took them to the ships or steamed up and down the long lines of anchorage. The second object of the mobilization is to train all the branches of the Navy in co-ordinating and perfecting the many details of preparation, which are involved in the mobilization of such an impressive force.

To those of us who have followed the growth of our new Navy with close attention, it is evident, at a glance, that the long line of warships includes representatives of every year of growth of our new Navy from the date of its birth in the early eighties. The array is so distinctly historical, that there may be found in it representatives of every shipbuilding programme from the time of the famous White Squadron down to the present year.

Thus, among the battleships, we find the "Indiana" and the "Massachusetts," which, with the "Oregon," now on the Pacific Coast, formed the first group of battleships to be built for our Navy. When they appeared, the world was startled by the great weight of their armament, which included four thirteen-inch, eight eight-inch, four six-inch and many smaller rapid-fire pieces. Following them came the "Iowa," which mounts four twelve-inch and eight eight-inch guns. Present at the review, also, are the "Kentucky" and "Kearsarge," which were commissioned just after the Spanish war. These ships carry four thirteen-inch guns, with four eight-inch superimposed above them—these vessels being the first of our ships to carry the double-deck turret. Next in order of age are the "Alabama," "Illinois" and "Wisconsin," the last of our ships to mount the thirteen-inch gun, of which each ship carries four. In them the eight-inch gun disappeared and its place was taken by a battery of fourteen six-inch guns, mounted in broadside. Next in historical order are the "Maine," "Missouri" and "Ohio," enlarged "Alabamas" with four twelve-inch and sixteen six-inch guns. The two classes are readily distinguished by their smokestacks, the "Alabamas" being the only ships in our Navy to carry their smokestacks abreast—an English custom of the period in which these ships were built. The "Maine" class has three smokestacks on the center line.

Next in date among the battleships at the review are the five vessels of the "Georgia" class, i. e., "Virginia," "New Jersey," "Georgia," Nebraska," and "Rhode Island." These vessels mark a great advance in size and fighting power over the "Maine" class, and the eight-inch gun and the double-deck turret reappear.

When instrument is focused, range is shown on a scale.

Range finder, mounted on turret roof.

Copyright 1912 by E. Muller, Jr.

Visible target is 20 feet high by 30 feet long. Towed at 10 knots.

Target used in battle practice.

It may be well, just here, to note the increase in size from the "Oregons" to the "Georgias." The "Oregons" are of 10,288 tons displacement; the "Iowa," 11,410 tons; the "Kearsarge" and "Kentucky," 11,500; the "Alabamas," 11,562; the "Maines," 12,500; and the "Georgias" about 15,000 tons. The "Indianas" were completed in 1895 and the "Georgias" in 1905. There was thus an increase of 50 per cent in the displacement of our battleships during the first decade of the new navy. The "Georgias" carry four twelve-inch guns in two turrets forward and aft, with two eight-inch superimposed. On each beam is a turret containing two eight-inch guns, and there is a secondary battery of twelve six-inch rapid-fire guns. These ships are heavily armored, and they are good to-day for a maximum speed of 19 knots.

The "Connecticut" class, which followed the "Georgias," is the last of the pre-dreadnoughts era. The "Connecticut," the flagship of Admiral Hugo Osterhaus, Commander-in-Chief of the Atlantic Fleet, was the first of six ships—the "Connecticut," Louisiana," "Kansas," "Vermont," "Minnesota" and "New Hampshire." They were completed in 1906 and 1907. They are of sixteen thousand tons displacement, and in recent sea trials have made from 18.42 to 19.02 knots. The battery consists of four twelve-inch, forty-five caliber guns in two turrets fore and aft, eight eight-inch forty-five caliber in four turrets on the broadside, and twelve seven-inch fifty-caliber guns disposed in a battery amidships on the gun deck.

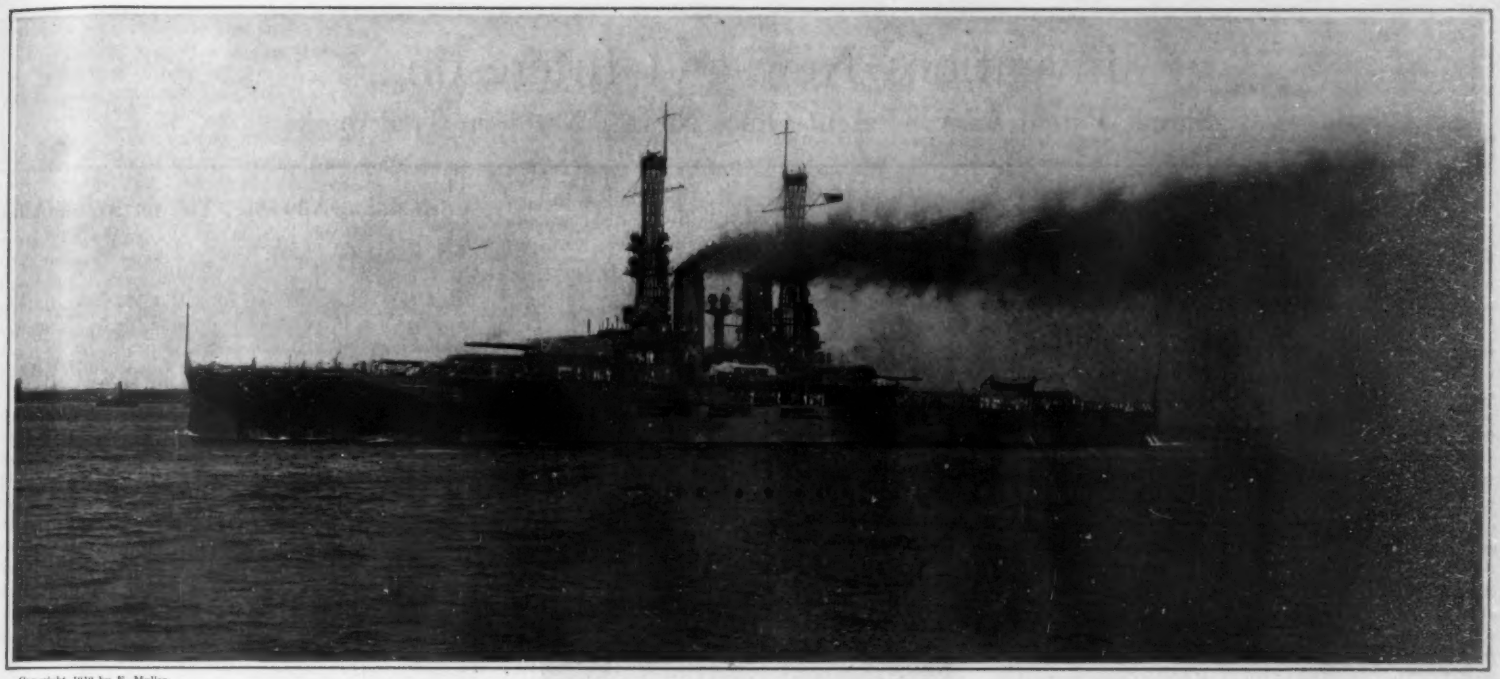
Smaller editions of the "Connecticut" are the "Idaho" (present at the review) and the "Mississippi," which is just now in drydock having her machinery overhauled. Congress and not the Navy is responsible for the fact that these ships are of only 13,000 tons, and have the low speed of only seventeen knots. Congress restricted the displacement to thirteen thousand tons, and the Department decided that it would be best to build smaller editions of the "Connecticut," reducing the speed and coal supply, and cutting out four of the seven-inch guns.

With the "South Carolina" and "Michigan" completed in 1909, our Navy entered its dreadnought era. These vessels, of 16,000 tons, are armed exclusively with twelve-inch guns. They carry eight of these in four turrets, two forward and two aft, on the longitudinal center line of the ship. The inboard guns fire above the roofs of the outboard turrets, and all guns are available on either broadside. This principle of mounting, first introduced in these ships, has become practically universal throughout the world. In their recent speed trials at sea the "South Carolina" made 19.68 knots and the "Michigan" 20.01 knots.

In the next class are the "Delaware" and "North Dakota" of 20,000 tons, completed in 1909, and the "Utah" and "Florida" of 21,825 tons, completed in 1911. These four ships mount ten twelve-inch forty-five caliber guns in five turrets, all placed on the center line. The broadside fire consists of ten guns and the forward and aft fire of four guns. The torpedo-defense battery consists of fourteen five-inch guns in the "Delaware" and "North Dakota" and sixteen of the same caliber in the "Utah" and "Florida." The former have recently made over 22 knots on their regular annual speed trials. The "Florida" made on her trials over twenty-one knots and the "Utah" over twenty-two knots.

The most interesting ships at the review are, naturally, the "Arkansas" and "Wyoming." They are our latest dreadnoughts, recently completed; they have the large displacement of 26,000 tons, and they are the first of our ships to mount twelve twelve-inch guns. These are mounted in symmetrically-disposed pairs of turrets, with one pair of guns firing above the roof of the adjoining turret. Two turrets are forward on the forecastle deck, two immediately abaft the mainmast, and two on the after part of the quarter-deck. These twelve-inch guns are fifty calibers in length, and have higher velocity and more penetrative power than the forty-five caliber guns of the "Utah" and "Florida." The secondary battery consists of twenty-one five-inch, fifty-caliber guns. The designed speed of the ship is 20.5 knots, the coal capacity is 2,500 tons, and 400 tons of oil are carried. A novel feature in these ships, which to our thinking adds greatly to their appearance, is the fact that there is no break in the sheer line of the upper deck, which astern has a freeboard of about 19 feet, and runs with a gradual rise to the stem, where the freeboard is between twenty-five and twenty-six feet. One advantage of this arrangement is that the broadside battery of five-inch guns is carried several feet higher above the water line than in the preceding vessels, which have a straight sheer and raised forecastle deck.

Next in interest to the battleships is the torpedo fleet, which is represented by 24 destroyers, 16 torpedo boats and 10 submarines. Our destroyers are fast, seaworthy boats, of 750 tons displacement. The later



Copyright 1912 by E. Muller.

Displacement, 21,825 tons. **Speed,** 22 knots. **Coal,** 2,500 tons. **Guns:** ten 12-inch, sixteen 5-inch. **Belt and turret armor,** 11 and 12-inch. Driven by 4-screw Parsons turbines.

Battleship "Utah;" sister ship is the "Florida;" both in the Review.

boats have a raised forecastle deck with a freeboard of sixteen feet. They are able to go anywhere on the high seas and endure the severest weather. The newest three and four-funnel boats of the "Patterson" and "Sterrett" type are good for from thirty to thirty-three knots.

The submarines are of the well-known "Holland" type, and perhaps no branch of the navy just now excites greater interest among the naval officers than the submarine service. Looked at askance a few years ago, the submarine is now regarded as a formidable arm of the service, the limit of whose possibilities in future warfare, when it shall have grown in size, speed and sea-keeping ability, it is difficult to determine.

Mention should be made of the division of four armored cruisers, which includes the "Tennessee," "Montana," "Washington" and "North Carolina." These are identical vessels of 14,500 tons displacement and over 22 knots speed. Completed 1907 and 1908, they represent a type of which no modern representatives are being built. Their place has been taken by the modern battle-cruiser, a ship exceeding the battleship in size, and from five to seven knots faster, possessing somewhat less gun power and less heavily armored, but still a vessel capable of lying in the first line of battle. We have none of this type of ship in our Navy, none is being built, nor as far as we know, has a battle-cruiser design been drawn. The "North Carolinas'" battery of four ten-inch and sixteen six-inch guns, and their light armor of five inches maximum thickness, renders them totally unfit to cope with the modern battle-cruisers which mount twelve and thirteen-inch guns and carry from seven to nine inches of armor.

In concluding this description of the ships present in this imposing review, we wish to express our belief that ship for ship and date for date, our vessels are fully the equal of, and in battery power the superiors of the average fighting ships of the same classes in the navies of to-day. Particularly powerful is our battleship fleet in gun-power. We believe that the vessels of the "Connecticut" and "Georgia" classes are more than a match for the pre-dreadnought ships of other navies; indeed, because of their heavy armor, they would be able to lie in line against any of the twelve-inch gun dreadnoughts of foreign powers.

The weak points of the fleet that lies in the Hudson River, if there be any, are its lack of battle-cruisers and a sufficiency of torpedo boat destroyers. Naval experts consider that there should be four destroyers to each battleship. Taking the effective battleship fleet of the first line at, say, twenty-five ships, we should have one hundred of these craft in the Hudson instead of the twenty-four that are in commission.

The New Parisian Telephone Exchange

IT is now four years since the central or Gutenberg telephone exchange at Paris was entirely destroyed by fire, and after that a temporary exchange was installed while waiting for the reconstruction of the building. At present the new exchange is erected and the apparatus is commencing to be installed. The new building is a handsome one, and is built on the site of the old one, next the central post office, but the somewhat narrow space due to the position of the ground is made larger by adding an overhang in reinforced concrete, so that the main halls on the different floors are no less than 210 by 36 feet.

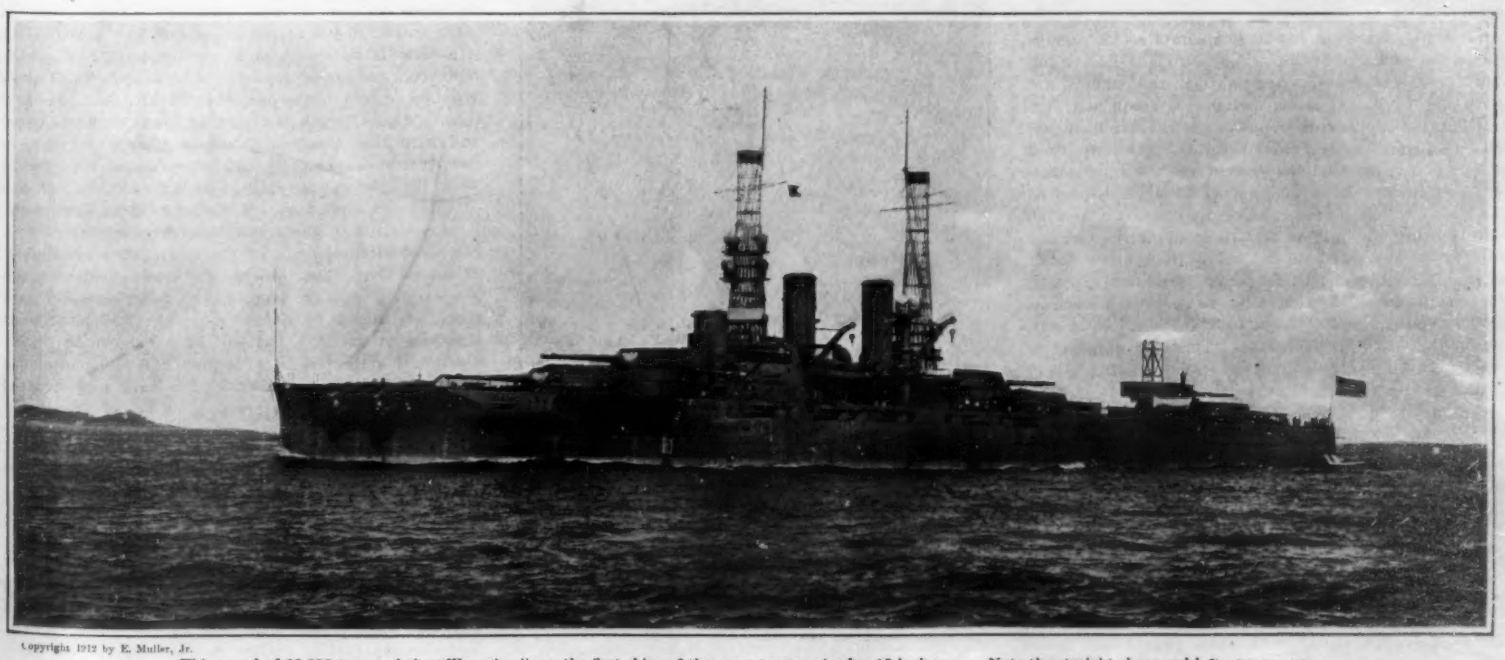
Nothing in its equipment has been overlooked which will contribute to good hygiene and safety, and the walls are now covered with white enamel, using diffused ceiling lights and dust aspirators. On the fifth floor are the apparatus for the multiple board, which occupy each side of the long hall and are designed for 10,000 city subscribers, also the interurban boards. A second exchange board of like capacity is to be installed on the fourth floor. The present exchange serves only the central district of the town, and there are a number of other exchanges in various parts of the city. It is expected that the new exchange will be in full operation during the early part of next year.

Gale's Comet

A TELEGRAM received at Harvard from Prof. Charles N. Wunder, director of the Leander McCormick Observatory, gives the following position of Gale's Comet as observed at the Leander McCormick Observatory:

September 30.52 G.M.T.
R.A. 15 hours 18 minutes.
Dec. —6 degrees 36 minutes.

The comet was plainly visible in a 6-inch finder, but was invisible to the naked eye. No nucleus nor tail could be seen with the 26-inch telescope.



Copyright 1912 by E. Muller, Jr.

This vessel of 26,000 tons and the "Wyoming" are the first ships of the navy to carry twelve 12-inch guns. Note the straight sheer and lofty freeboard. Driven by 4-screw Parsons turbines. **Speed,** 21.5 knots.

Battleship "Arkansas," the most powerful ship at the Naval Review.

Inventions New and Interesting

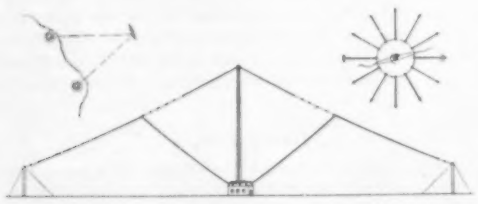
Simple Patent Law; Patent Office News; Notes on Trademarks

A Radio-telegraphic Compass

By Our Berlin Correspondent

NOT many years ago the Prussian Department of Public Works commenced some interesting experiments with a view to finding a method for determining the position of ships, dirigibles, aeroplanes, etc., in foggy weather. At two fixed points on the Müggel Lake, near Berlin, sets of antennæ were installed, each set consisting of thirty-two small poles equally spaced on the circumference of a circle six hundred and fifty feet in diameter. A wireless telegraph transmitter at the center of the circle was successively connected with pairs of diametrically opposed antennæ, and a different signal was given out from each. A wave-length was chosen equal to twice the diameter of the circle, so that the impulses of opposite phase would add themselves in the plane of the two antennæ, producing signals of maximum intensity in that direction, while at right angles to this plane the two impulses would strike the receiver simultaneously, compensating one for the other and producing a signal of minimum intensity. The positions of these stations were marked on the map, and the corresponding letters of each pair of antennæ, so that an airship could determine its position with respect to these two stations by noting which letters were received with a maximum intensity.

This scheme has recently been modified to facilitate the work of the telegraphist, and reduce the tax upon his memory. To the circle of antennæ as previously provided, another non-directed antenna is added. From the non-directed antenna short time signals are given out periodically, and these are followed by a succession of signals from the pairs of directed antennæ. These signals are identical with one another, and always begin at a given antenna, namely, the north-south antennæ, continuing therefrom in clockwise direction at a constant speed. A stop-watch is employed as a compass at the receiving station, the hand of the watch



Arrangement of the sending antennæ.

having the same angular velocity over the dial as that of the successive signals about the circle of antennæ. The receiver on hearing the time signal from the non-directed antennæ starts his stop-watch at the moment that the transmitter begins giving out directed signals. As soon as the signals are heard with a minimum of intensity, the receiver stops his watch and the hand then marks the direction corresponding to the minimum of intensity in the reception of signals. It takes but half a minute to complete a set of signals. Hence ten series of readings may be made in five minutes. At the transmitting station, the signals are given out by a self-acting switch. Consequently, the transmitting apparatus requires no superintendence. The aeronaut, knowing his direction, from two fixed points, can easily find his position at the intersection of two lines drawn in the corresponding directions on the map. It has been suggested that a series of such radio-telegraphic stations be located along the German frontier at distances of not more than thirty miles apart. Such stations would be of particular value on the north coast of Germany, to protect aeronauts against an involuntary flight over the sea. It is estimated that each station would require ½ kilowatt of energy which could be derived from existing power stations.

An Application Long Pending

A PATENT, the application for which was pending a long time, in fact almost equal to the record of delayed cases, is that issued on September 3d, 1912, No. 1,037,842, to Robert Creuzbauer of New York, N. Y., Helen M. Creuzbauer and Carrie Creuzbauer of Brooklyn, N. Y., and Grace C. Nichols of New York, N. Y., executors of said Robert Creuzbauer, deceased.

The application was filed in the United States Patent Office, July 7th, 1888, more than twenty-four years prior to the issue of the patent.

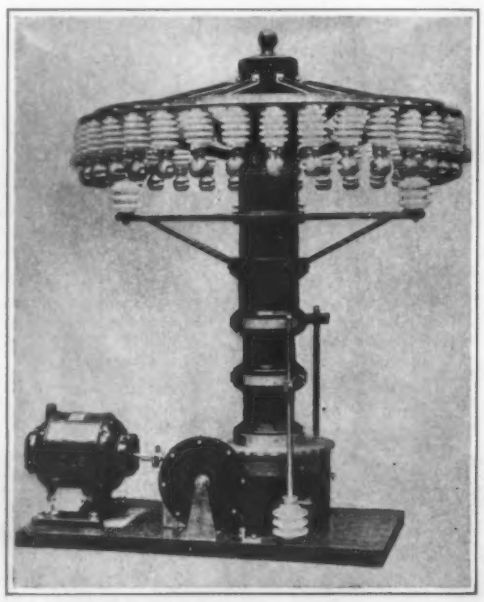
The inventor at the time of filing his application for a patent was a resident of Brooklyn and filed the application without having any attorney of record, and the application was prosecuted from time to time without an attorney's aid up to September 1st, 1890, when an attorney was appointed.

The record shows that many official letters were written in the progress of the case. The case was before the Commissioner on petition. The inventor died, and letters testamentary were filed in the application.

The radio-telegraphic compass.

When the application was filed in the Patent Office, Benton J. Hall was Commissioner of Patents and Prof. Fowler was examiner in charge of the class to which the application was assigned. Both of these officials have passed away, and Mr. Grenville Lewis, who was assistant examiner to Mr. Fowler at the time and subsequently became principal examiner in charge of the class, has also died, so that the application survived, in the Patent Office, the Commissioner, the examiner and the inventor.

The writer was told that during the progress of the case, the inventor grew old and extremely eccentric, and the family delayed the prosecution of the case until after his death, so that they might be able to handle the patent when issued, without obstruction or



The revolving radio-telegraphic transmitter.

interference by him. This may or may not be true. It appears from the record that letters testamentary were granted upon the estate of Robert Creuzbauer on December 5th, 1911, and thereafter the application was prosecuted to its formal allowance on February 26th, 1912.

A Self-sealing All-rubber Tire for Automobiles

WITH the development of the automobile great strides have been made in eliminating the various sources of trouble in design and manufacture, and it is a rare thing to see an automobile disabled through imperfections in the motor or other parts; but one great source of annoyance—tire trouble—has so far resisted all attempts to overcome it without, in doing so, introducing objectionable features.

Many attempts have been made, especially in the past year, to produce a satisfactory tire by the use of various fillers, but this is at best a poor compromise between the solid and the pneumatic tire. The solid tire is, of course, impossible for pleasure riding. The pneumatic tire, aside from its liability to puncture, etc., is ideal for the pleasure car, and while various "filled" or "airless" tires do present certain advantages, they do not meet the requirements in point of comfort of riding and safety of the motor from injury.

With many technical minds concentrated upon this problem there is every reason to expect that it will sooner or later be solved. A new form of inner tube which has recently been placed on the market is well worthy of consideration as seemingly representing an important step in the right direction.

This tube contains no filler, no "dope" of any kind, but is a regular pneumatic tube inflated with air in the usual way, which, owing to some peculiar and very ingenious features in its construction, is in a large measure self-sealing, and will hold the air for a long

Fig. 1. **Fig. 2.** **Fig. 3.**

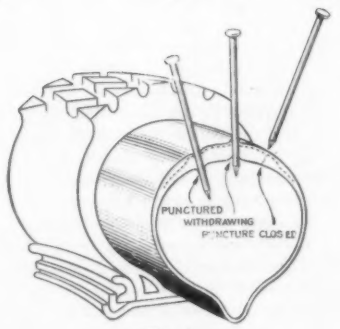


Fig. 4.

time, it is claimed, even after receiving a very severe puncture. The principle on which the construction of this tire is based can best be explained by reference to our illustrations. The inner tube is made rather heavy at the tread and has imbedded in it a strip of canvas seen in section in Fig. 1, which represents the appearance of the tube when first made. We now come to the important feature of the new tube. After a length of tubing has been made as usual and with the structure shown in Fig. 1, the tube is now turned inside out. An inspection of Fig. 1 will show that the canvas strip, forming as it does an arc of the inner circumference of the tube as first made, is necessarily shorter than the corresponding arc of the outer circumference of the tube. The consequence of this is that when the tube is turned inside out, the canvas strip is under tension, and being inelastic, and, therefore, unable to give way to this tension, it holds the deflated tire in a flat position as shown in Fig. 2. On inflation the tire is, of course, forced to assume a circular form, and the canvas strip being now situated on the external circumference and being, as already pointed out, inextensible, compresses the rubber underneath it, so that the tread portion of the inner tube is always under compression and, therefore, self-sealing. In point of fact a puncture made with a sharp nail or point seals itself automatically, so that it cannot be detected by the usual immersion in water.

The diagram of Fig. 4 is intended to show roughly the way in which the rubber behaves when a puncture is made. The nail on the left is shown in its entering position, when it drags the fiber of the rubber with it and raises a tuft of rubber on the inside of the tube. The nail on the right is being withdrawn and the fiber of the rubber is following in its motion. On the extreme right is seen a puncture sealed by the rubber

after the nail has been extracted. Experience with this tube has so far given very excellent results, and the principle on which it is constructed appeals to one by its great simplicity and soundness.

The tube is the invention of John Hamilton Brown, who is known to the readers of this paper as the inventor of a wire-wound gun. If the new tire fulfills the expectations which are placed upon it, the inventor and manufacturers deserve our best wishes for success in perfecting this tube and placing it within the reach of the motorists, whose troubles from accidents to tires have been aggravating in the extreme.

Notes for Inventors

An Illusion Stage Device.—In patent No. 1,036,208 John B. Fitzpatrick of New York city presents an illusion apparatus including a substantially vertical track or frame within which a performer can walk. Means are provided for supporting the performer within the track or frame and to rotate within the frame as he traverses the circular track.

An Artificial Sausage Skin.—We have imitations of various sorts or substitutes, if you please, but Carl Hugo Hasselblad of Stockholm, Sweden, has patented, No. 1,036,939, an artificial sausage skin consisting of a sleeve of fabric impregnated with a gluey substance and in the production of which the sleeve of fabric is impregnated with a decoction of bacon rind and is also stiffened by the action of a salt of aluminium.

A Device to Identify Motor Vehicles in Case of Accident.—Oscar A. Weissenborn of Jersey City has secured patents, Nos. 1,036,942 and 1,037,092, relating to means for identifying motor or other vehicles in case of accident and by which he provides for the release in case of accident of a number of identification cards or checks. In one patent the cards are held in a receptacle, the cover of which is withdrawn in case of accident while in the other the identification checks are mounted on brackets secured to the front of the motor vehicle.

A Novel Cow Milker.—John Huggler of Indianapolis, Ind., has secured a patent, No. 1,034,454, for a cow milker, which simulates very closely the action of the hand in milking. The machine, however, fits against the underside of the animal's udder and is movable up and down and laterally and has fingers arranged in separate series for each teat, with the fingers so operated, that a starting movement of the fingers will be in succession from the upper one to the lower one, so that the milk will be gradually discharged from the teat.

A Fessenden Wireless Patent.—A patent, No. 1,035,334, has been issued to the National Electric Signaling Company as assignee of Reginald A. Fessenden of Brant Rock, Mass., for a wireless telegraph apparatus within an inclosure of energy-absorbing material with a protecting sheath composed of a non-absorbing conductor between the energy-absorbing material and the conductors of the apparatus. In its application to an iron ship, which forms the inclosure, the lead from the outside antennæ to the inclosed apparatus, is surrounded by a copper sheath where it passes through the walls of the inclosure.

Cushion for Baggage Trucks.—To protect trunks from damage when unloaded from or loaded on trucks in baggage rooms a cushion of simple construction has recently been put into use on a prominent railroad line. The cushion is in the form of a mat 22¼ inches wide and 4 feet 4 inches long. It is made of four strips of hardwood, 4 inches wide and running the full length of the mat, across which are nailed twenty-four pieces of airbrake hose. The hose is held in place by means of half-inch clout nails, driven through the slats and clinched on the under side. The nails are clinched to the hose by means of an iron rod inserted while the nails are being driven in.

RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Aviation.

ELASTICALLY CONNECTED SURFACES FOR INSURING THE STABILITY OF AIRSHIPS, AEROPLANES AND SUBMARINE BOATS.—G. A. CROCCO and O. RICALDONI, Laboccetta, Rome, Italy. This invention diminishes the surface necessary for securing the stability of moving bodies such as dirigible airships, other aerial machines, self-propelling torpedoes, submarine boats, etc., by making use of planes with increased stabilizing action, provided either at the tail, or both at the head and the tail simultaneously, so that they cooperate, both during forward as well as backward movement.

AEROPLANE.—D. A. DAVISON, Murphy's Hotel, Grace St., Richmond, Va. This invention consists more particularly in a novel form of main sustaining planes or wings. An object is to provide means for maintaining equilibrium. A further object is to provide a novel form of plane which overcomes the disastrous effects of side movement due to the peculiar formation of the sustaining wings.

Of Interest to Farmers.

APPARATUS FOR SPROUTING GRAIN.—E. MCFARLIN and A. CLINE, Doniphan, Mo. An object here is to provide an apparatus by means of which the grain may be kept at the required temperature and can be supplied with moisture as desired. Further, to provide means for fertilizing seeds during the sprouting period, so as to obviate the necessity of mixing the fertilizer with the seed prior to planting.

GRAIN SHOCKER.—P. W. SHARP, R. F. D. No. 3, Osakis, Minn. This shocker is adapted for attachment to any grain binder. The bundled grain is delivered from the binder platform to a receiving disk, wherein the bundles are grouped and held around a conical support until enough bundles have been thus assembled, after which the operative mechanism is automatically set in motion and a shock conveyer automatically grasps the assembled bundles and sets them on the ground formed in a shock.

Of General Interest.

DRINKING FOUNTAIN.—T. E. LINDSAY, Jackson, Tenn. The object of the inventor is to provide a new and improved drinking fountain formed with improved means for dispensing the drinking fluid, and associated with improved means for providing a cooling element and a flushing device.

COAL DISTRIBUTOR.—E. L. VISE and C. DENHAM, P. O. Box 55, West Terre Haute, Ind. In this patent the invention relates to an apparatus whereby coal is discharged from a primary distributer upon another which is in the nature of a chute adapted to deliver different grades of coal to different receptacles, especially cars for transportation.

FISH NET REEL.—H. A. MONROE, 367 8th St., Astoria, Ore. This invention provides a reel for gathering fish nets, adapted to be manually or power-driven; provides a reel having gripping devices which are arranged to yield to a predetermined strain, to avoid breakage of the same; and provides an outrigger conveyer section for extension beyond the gunwale of the boat for which the reel is provided.

Hardware and Tools.

PRUNING KNIFE.—W. SCIONEAUX, care of L. J. Le June, Donaldsonville, La. In this instance the invention relates to a new and improved form of pruning knife, and is particularly adapted to be used as a briar hook on the edge of a bank of a ditch, to cut and at the same time raise the grass from the bottom of the ditch.

ATTACHMENT FOR SQUARES.—L. M. HODGE, Wilmington, Cal. In this case use is made of a stock having clamping devices for clamping the stock to the members of a square, a graduated straight arm held on the stock and provided with an angular foot adapted to rest on one edge of one of the members of the square to hold the arm at a right angle to the said members, and a graduated segmental arm mounted to swing on the stock and adapted to be fastened thereto.

Household Utilities.

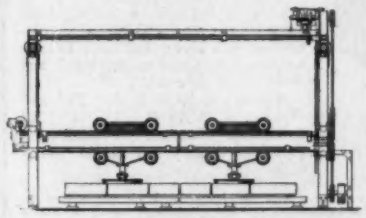
APPARATUS FOR FLUSHING WATER CLOSETS AND THE LIKE.—H. GOLDAU, Züllichau, Prussia, Germany. In the present invention the improvement has reference to an apparatus for use in flushing water closets, and the like, and is designed to enable two different quantities of water to be caused to flow into the closet pan, so that either the usual, or the smaller, flushing action is secured.

CLOSET ATTACHMENT.—HARRY R. KIESSIG, 2037 Virginia Ave., Berkley, Cal. By means of the construction of this device the easiest and best position is secured for carrying out the physiological and anatomical purpose of the invention. No change need be made in the usual equipment of the bowl, and the seat may be used in the ordinary way if desired.

ADJUSTABLE BED.—D. B. ALLEN, care of Max Levy, attorney, Newport, R. I. An object of this invention is to provide a device which may be attached to an ordinary bed near the upper end thereof, which forms a shoulder and head-rest for the occupant, and which may be adjusted at various angular positions for supporting the body at various inclinations.

Machines and Mechanical Devices.

POLISHING MACHINE.—J. F. MARONI, Wheelock St., Montpelier, Vt. This machine is for use in treating or dressing stone, or other material. In operation and the cable running, the bridge may be brought to one side, while a bed of stones is prepared on the other, an overhead crane being used to bring the stones to the machine and leveling the same. The bridge is then moved over the bed and the scrolls brought into contact with the

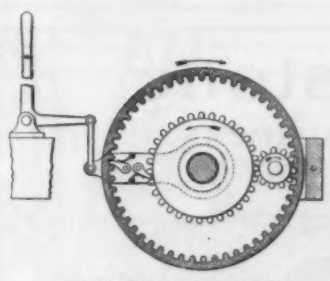


POLISHING MACHINE FOR GRANITE OR MARBLE.

work and started to operate. While the scrools are engaged on the bed, the crane is preparing another bed on the other side, and when one bed is completed the bridge is moved over to the other bed, and so on, one always being ready for the machine. Shifting of the bridge laterally while the trolleys are traveling longitudinally is desirable. A side elevation of the machine is shown in the accompanying engraving.

Prime Movers and Their Accessories.

INTERMITTENT GRIP DEVICE.—J. CALKINS and F. RICE, 502 Huron St., Port Huron, Mich. The invention relates to a device forming part of a cranking or starting mechanism for internal combustion engines, such as used on automobiles, motor boats, aeroplanes and other machines and devices. Use is made of a manually controlled lever, carrying spring-pressed pawls engaging concentric gear

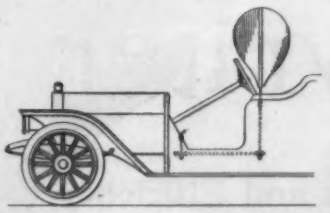


INTERMITTENT GRIP DEVICE.

wheels geared together by an intermediate gear wheel, these gear wheels being secured on a shaft, and a spring-pressed clutch mechanism connecting one of the said gear wheels with the shaft, so that when the lever is actuated the shaft is driven continually in one direction. The engraving shows a sectional elevation of the engine starting-mechanism connected with an engine shaft.

Pertaining to Vehicles.

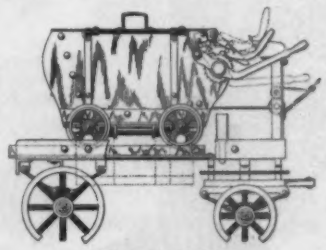
AIR DEFLECTOR.—H. C. DUNLAVY, 705 O St. Fresno, Cal. This inventor provides an air deflector, more especially designed for use on high speed or racing automobiles and other power-driven vehicles, and arranged to counterbalance the lateral or centrifugal force which is developed on the vehicle traversing



AIR DEFLECTOR APPLIED TO AN AUTOMOBILE.

a curved course, the air deflector serving to relieve the wheels or tires of undue strain, and prevent slipping of the tires on the roadway. For this purpose, use is made of a vane mounted on a vehicle shaft journaled on the vehicle and under the operator's control. The accompanying illustration shows a side elevation of the air deflector as applied to an automobile.

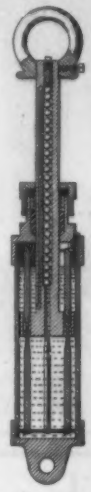
DUMPING VEHICLE.—J. JANUKAYTIS, 234 26th St., Brooklyn, N. Y. The invention relates to a dumping vehicle particularly adapted for the transportation of asphalt, and shown herewith in a side elevation, parts of the truck being broken away to show the



DUMPING VEHICLE.

track and showing the mechanism in two parts. It provides a street truck which may be used as is usual with trucks of this character and which may be converted into an open bottom truck for the discharge of material carried by a cart mounted thereon. The vehicle has improved means for dumping the material from the cart, which means is disposed adjacent the driver's seat.

SHOCK ABSORBER.—F. M. RENNIE, 344 W. 18th St., New York, N. Y. This invention is intended more particularly as an improvement in pneumatic shock absorbers for automobiles and other vehicles, whereby the device is adapted to cushion sudden relative movements between the traction wheels and



SHOCK ABSORBER FOR VEHICLES.

the vehicle body. The movement between the relatively movable parts is restrained during the last part of each of the long strokes yet is substantially unrestrained during the first part of said strokes as well as during the shorter strokes. The invention also provides means for taking up the heavy jars independently of the means absorbing the relative slight pulsations. The engraving shows a vertical transverse sectional view of the invention.

CARRIAGE WINDOW.—A. M. MODRY, 487 Prospect Place, Brooklyn, N. Y. This invention comprises a pocket into which the window sash can be inserted, and from which withdrawn; and means for guiding the sash in the course of its movements into and out of the pocket. These means engage the edges of the sash at all times with sufficient tightness to eliminate objectionable jarring and rattling met with in many carriage windows now in use.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

WE wish to call attention to the fact that we are in a position to render competent services in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patent applications, irrespective of the complex nature of the subject matter involved, or of the specialized, technical, or scientific knowledge required therefor.

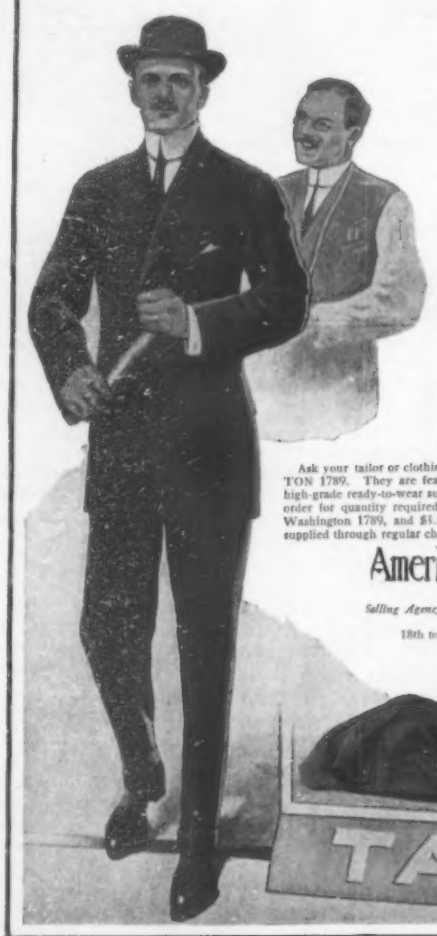
We are prepared to render opinions as to validity or infringement of patents, or with regard to conflicts arising in trade-mark and unfair competition matters.

We also have associates throughout the world, who assist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United States.

MUNN & CO.,
Patent Attorneys,
361 Broadway,
New York, N. Y.

Branch Office:
625 F Street, N. W.,
Washington, D. C.

The Tailor is Proud of that Suit



OSWEGO SERGE is an inspiration to the tailor. He loves to work with it because Oswego has the beauty, the drape and hang to accentuate the effect of smart cut and skillful tailoring. And he knows the intrinsic quality of cloth is there to make the suit stand up and look well through long wear.

OSWEGO SERGE

is a true style-fabric, a thoroughbred serge for the man who cares. A distinctive rich blue; Fall and Winter weight—16 ounces to the yard and every ounce pure wool.

Another style-fabric for Fall and Winter is WASHINGTON 1789 Unfinished Worsted. A cloth that shows its quality and tailors splendidly.

Ask your tailor or clothier to show you OSWEGO SERGE and WASHINGTON 1789. They are featured by good custom tailors and may be had also in high-grade ready-to-wear suits. If you cannot find them, send us check or money-order for quantity required (3½ yards for men's suits), at $3.25 per yard for Washington 1789, and $3.00 for Oswego Serge, and we shall see that you are supplied through regular channels, as we do not sell at retail.

American Woolen Company

Wm. M. Wood, President.

Selling Agents: American Woolen Company of New York
American Woolen Bldg.
18th to 19th Street on 4th Avenue, New York

The Keystone of Modern Business

The Underwood Typewriter

Promotes Progress and Efficiency

Perfects Service and System

"The Machine You Will Eventually Buy"

UNDERWOOD TYPEWRITER CO.
(INCORPORATED)
Underwood Building New York City
Branches in all Principal Cities

Duplicating Machines

(Concluded from page 308.)

Events began to move more rapidly, with the result that other flat-bed duplicators appeared upon the market—other cylinder duplicators appeared, each in its turn claiming to be a further improvement and development over the former models.

Duplicating machines are now on the market with address plates, which can be inserted in the machine so that each letter duplicated is addressed at the same operation. The advantage of a machine of this character lies in the fact that the inked impression of the address and the reproduced letter are identical, as both are printed from the same ribbon.

Then followed the direct inking device, attached to a duplicating machine and the automatic feed, so that to-day a duplicating machine becomes an office printer, as the operator simply places in the machine an electrotype plate, together with a quantity of paper, turns on the current and the machine does its own feeding, printing and ejecting.

To go a step further, another firm brings out a machine that is a duplicating machine and addressing machine in one. It, too, is automatic, and after the form is set-up the operator takes the addressing machine list, places the addressing plates in the magazine, equips the outfit with a supply of paper, turns on the current, with the result that the name, address, and salutation are automatically changed upon each letter. In other words, the letter is ready for final mailing.

More recently, one of the duplicating devices has been equipped with a signature device so that when the letter is duplicated the signature is automatically placed upon the bottom of the letter, and the imitation is so excellent that it is accepted by many as a true signature.

While the office duplicating machine for duplicating letters in quantities was being developed to a high point of perfection the machine for producing shop orders and for splitting orders for departments was not being neglected. To accomplish this work rapidly a mechanical means was developed by taking the gelatine rolls, which had been used in the old-fashioned way for so many years, and mounting the rolls on a metal frame equipped with a carriage, thus making it possible to deliver and remove the copies from the gelatine rolls through mechanical means. The result of this improved device has been that thousands of dollars have been saved by a number of large electrical firms, packing companies, and steel companies, who have been enabled to effect a saving in one month which paid for the entire equipment.

Very recently there has been produced a remarkable photographic device which delivers within a few minutes a duplicate of a design or drawing—photographically reproduces a piece of machinery or a sample cartoon, or supplies a photograph of a new lace curtain design. In fact, this new photographic device can be used in a thousand different ways in the conduct of business, and for this device there is already a very large field prepared to adopt the outfit as rapidly as it is known that such a machine is available.

Signing Ten Times at Once.

Another wonderful duplicating device is the signature machine, which enables the user to sign his name ten or twenty times in one operation.

Through the use of a master pen all pens attached to the device are controlled and bonds, checks, and certificates are signed with great rapidity.

With all the wonderful duplicating devices and systems of all kinds and characters, the largest duplicating field of all remains untouched. A fortune awaits the inventor who will give his thought and attention to the simplest field which is the biggest field of all. There is to-day a world-wide demand for a simple device, not too cumbersome or expensive to install and not too expensive to maintain, which will enable each business house to

PATENT ATTORNEYS

PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of more than sixty years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to PATENTS, TRADE MARKS, FOREIGN PATENTS, etc.

All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

MUNN & COMPANY
361 BROADWAY, NEW YORK
Branch Office, 625 F Street, Washington, D. C.

Gasoline Engine

Absolutely free trial of Schmidt's Chilled Cylinder Engines. If you keep this engine, send first payment of only $7.50. Long time on balance. Price same as dealers pay. Marvelous **chilled cylinder.** Your choice of sizes. **Five years' guarantee.** Free book, **After Trial** "How to Use Power." Write for all particulars. **$7.50**

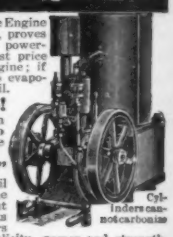
SCHMIDT BROS. CO. ENGINE WORKS
Department 2397 Davenport, Ia.

SUCCESS SHORTHAND

The best system for beginners; a post-graduate course for stenographers. Highest world's records for speed and accuracy and a greater number of court reporters than any other system in the last seven years. Instruction by mail; satisfaction guaranteed. **Write for FREE catalog.**

SUCCESS SHORTHAND SCHOOL
W. L. James, Chief Instructor
Dept. 310, Schiller Bldg. Chicago, Illinois

Use KEROSENE Engine Free!



Amazing "DETROIT" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

Gasoline Going Up!

Gasoline is 9c to 15c higher than coal oil. Still going up. **Two** pints of coal oil do work of **three** pints gasoline.

Amazing "DETROIT"

—only engine running on coal oil successfully, uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts —no cams—no sprockets—no gears —no valves—the utmost in simplicity, power and strength. Mounted on skids, all sizes, 2 to 20 h. p., in stock, ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. **Prices** (stripped), **$29.50 up.** Sent any place on 15 days' Free Trial. Don't buy an engine till you investigate money-saving, power-saving **"Detroit."** Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get **Special Extra-Low Introductory** price. Write 138

Cylinders cannot carbonize

DETROIT ENGINE WORKS, 127 Bellevue Ave., Detroit, Mich.

Here's a stone that will keep your tools in Perfect Condition

CARBORUNDUM

Round Combination Stone

For carpenters and woodworkers.

Three big reasons why Particular Workmen insist on having this sharpening stone:

1—It is made of carborundum—the most remarkable sharpening material ever produced.

2—It is a combination stone, moderately coarse on one side—smooth on the other.

3—It is round—4 inches in diameter—Permits the rotary motion so necessary to proper sharpening More square inches of sharpening surface than any other stone.

There is a carborundum sharpening stone for every sharpening requirement. You'll find them in hardware stores everywhere.

THE CARBORUNDUM COMPANY
Niagara Falls, N. Y.

Pyrene TRADE MARK FIRE EXTINGUISHER

There is Profit in Fire Protection

To remove the dread of fire is just as important as to install the very latest labor-saving devices in your plant.

The improvement of working conditions means the improvement of work.

Size 3 in. in diameter; 14 in. long. Weight 5 lbs. filled. Always ready for use.

At every danger point in your plant, place Pyrene Fire Extinguishers—the most efficient known. **Then having removed the dread of fire, watch for the improvement of work and the increased production.**

Pyrene employs a new principle in fire fighting. It smothers with a heavy non-injurious gas-blanket and does not wet down or stamp out by mechanical pressure.

Brass and nickel-plated Pyrene Fire Extinguishers are the only one-quart extinguishers included in the Lists of Approved Fire Appliances issued by the National Board of Fire Underwriters.

Weight 5 lbs. filled, Length 14 inches, Diameter 3 inches.

Solid Brass - - - - 7.00
Nickel Plated - - - 8.00

Write for free illustrated booklet.

PYRENE MFG. CO.
1358 Broadway, New York City

secure from one to six copies of its statistical reports, sales records, departments charts, balance sheets, etc.

There is a demand for a device or system which will secure a true reproduction of certain correspondence, some of which is accompanied by intricate orders or sketches, the original of which must remain in the office. At the present time it is necessary to make a duplicate by hand so that quotations upon certain work can be secured through other departments. If a simple and inexpensive device can be secured thousands of dollars can be saved, as with one or two copies of a letter made at a moment's notice, invaluable time could be saved.

If, at the present time, an important letter is received which two officials must see immediately, one must now wait upon the other, while in some cases there is nothing to do but make copies of the letter or papers so that two or three officials can each have their working copy.

Street railways make up large reports weekly. These reports have been added to day by day with a pen, and when completed from four to six copies are needed, but at the present time there is no method except to take carbon copies of these sheets, which are nothing but a mass of figures in columns and ruled boxes.

Inventors have apparently been looking at the duplicating proposition from the outside of the office, and have given little attention to the largest field of all, nor have they appreciated the opportunity which is waiting for the man who will give the business world the duplicating device which they need most of all.

How One County Built a Good Road

(Concluded from page 298.)

hint that an entirely new and shorter road between important points might be opened, and that it would very likely run through his property. Well, it was the disagreeable task of the commission to undeceive nine tenths of the farmers in the district. It was to be expected that some of the hearings before the commission would be a trifle strenuous, and the members were not disappointed.

However, at length it was decided to pave with brick the road leading from Chester, the largest town in the district, toward Hookstown, as far as the Pennsylvania State line, a distance of three and one half miles. The road leading from Chester to Fairview, a town in another district in the same county, is to be paved for two and one half miles. The remaining money is to be expended upon paving one road leading from Newell and one from Arroyo, the only other towns in the district.

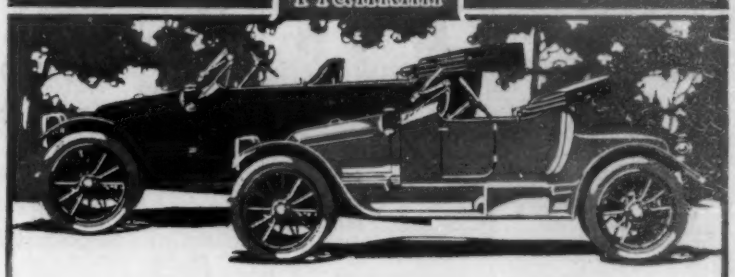
Surveyors and engineers were then employed and grades established, for the most part along the lines of the old roads, though occasionally to secure a road not quite so precipitous slight deviations were made from the old highway. In one place where a road followed the bed of a small creek for a short distance in a narrow valley, it was necessary to cut an entirely new road in the hillside.

It was decided that the foundation should be of broken stone seven inches thick, covered with three inches of gravel and two inches of sand. On this foundation bricks four inches thick are to be laid. The pavement itself will be nine feet wide with concrete curbs on each side. A dirt driveway will parallel the pavement. Wherever practicable it will be of the same width as the pavement.

While the cost of grading is heavy, stone for the foundation costs practically nothing, for in most places it can be dug from ledges along the road. Gravel and sand can be procured at small cost from the Ohio River. The paving brick are manufactured in the country scarcely ten miles from where the roads are being built and can be shipped to the district at small cost for freight. The contract for grading, paving and curbing was let by competitive bidding after the specifications had been well advertised in the local papers. A man, from another State, from Ohio, secured the contract.

Notwithstanding the bitter opposition

Franklin



Franklin "Little Six" Thirty

A full powered, efficient car of light weight, operated at low cost.

Silent, smooth running and flexible—the only six-cylinder "Thirty".

Built in two types—a five-passenger touring and a two-passenger Victoria-Phaeton. Price $2,800.

Men accustomed to studying and analyzing the technical reasons for unusual mechanical results will be interested in knowing why Franklin motor cars (1) use less gasoline, averaging 20% to 35% more mileage per gallon; (2) use less oil, averaging 400 miles per gallon, without smoke; (3) use fewer tires, averaging 8,000 to 10,000 miles per set, the 1911 record; (4) travel faster in the long run, owners thinking little of making 250, 300 or even 350 miles and more per day, without fatigue; (5) ride easier, bowling along so smoothly and comfortably, without jolt or jar, that driver and occupants are unconscious that they are steadily traveling 30, 35, and 40 miles per hour; (6) and wear longer than other cars, depreciation being much less, due to the intelligent, scientific use of carefully selected materials.

There are sound technical reasons for each of these facts. They are clearly defined in an interesting, concise style, in a booklet, entitled "An Analysis of Franklin Motor Car Construction", recently issued by our engineers.

A copy will gladly be mailed on request to any one seriously thinking of buying a car. Of course, requesting this booklet does not obligate you in any way, nor entail listening to the all-too-common, follow-up solicitation, but we would appreciate your writing on your business stationery and signing your official title. Kindly address Department S.

FRANKLIN AUTOMOBILE COMPANY Syracuse N Y

The one real office necessity

is one that is not an expense but a business-builder and an expense-cutter.

The New No. 76 Edison Rotary Mimeograph always

Most complete latest and best

Where there is a typewriter there should be a Mimeograph.

Saves 50% to 90% of your printer's bills

Any office help can operate the machine easily and quickly at a very small expense, when you want duplicate copies of any handwriting or typewriting, and print just as many copies as you need. No delays or inconveniences. It is specially adapted for printing notices, price lists, instructions, reports, statements, forms, bulletins, drawings, etc. Standard colors of inks are used. The work is as perfect as original writing. You can print 100 copies in 2 minutes for about 4 cents.

It is unequaled as an advertising medium or business getter. You can bombard your entire mailing list with letters, propositions and quotations, in as quick time as you could get the job from the printer. You can have your business bringing message in the mails before the words get cold. It brings results as no other office device can—*the one real office necessity.*

Let us have it demonstrated to you—no obligation to buy. If it proves to be a great necessity, you will want to buy. If you prefer, ask us first for complete information free.

Made only by

A. B. Dick Company 730 W. Jackson Boulevard, CHICAGO
15 Murray Street, NEW YORK

No more idle waiting desks

HOW many half-time desks in your office—desks and machines standing idle while the stenographers are somewhere else simply taking notes *or getting ready* to write your letters?

Did you ever figure up the "half-time" girls you pay full wages—the half-time typewriters you pay full price for—the half-time desk room you pay full rent on? Can your business *stand* this half-time production at full expense, when there is a way to make stenographer, desk and machine *produce* every minute of the day?

But even more important than your typist's time—large as the saving totals day by day—is *your* time, the time of the high-priced man.

When you dictate *now*, you must wait for your stenographer to come with book and pencil. You must adjust the speed of your speech to her ability to take it down. Often you must wait for her to catch up. Your whole day's work is measured, not by *your* capacity, but by the capacity of your stenographer.

Dictate to the Dictaphone

and put an end to *waiting*, to the long hours of *getting ready*. Your typist begins work at *her* desk practically as soon as you do at *yours*. Your first letter dictated, she starts transcribing it, and from then on *all* day, no matter what you are doing, she is busy. She turns out twice as many letters because she is at her machine twice as long. She does them faster and better because she does not need to strain her eyes looking back and forth from her book. She does not stop to decipher illegible notes. She simply *copies* fast and easily what you have talked into the Dictaphone—what the Dictaphone talks to her.

You can dictate any time—get the idea out of your system while it is hot with enthusiasm—and you don't have to stumble along at eighty words a minute. There is no speed limit to the Dictaphone. You can talk fast, naturally, energetically, two hundred words a minute if you wish—just as you would if the man you wrote to sat beside your desk. Result: not lifeless formalities, but red-blooded letters that get results.

Don't worry about the cost of the Dictaphone. You can figure yourself that when it cuts your correspondence expenses in half it is going to pay for itself in a very few months.

Demonstration in your own office and on your own work. Reach for your telephone and call up "THE DICTAPHONE." If you don't find that name in the telephone book, write our nearest distributing branch

THE DICTAPHONE (Columbia Phonograph Company, General, Sole Distributors), 138 Tribune Building, New York

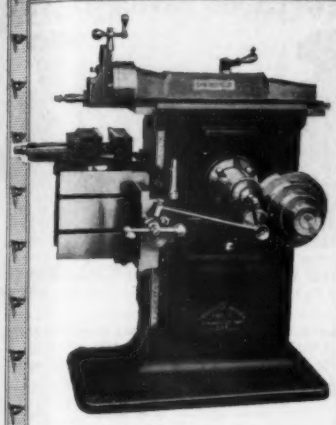
Atlanta, Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Hartford, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Minneapolis, Montreal, New Haven, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Me., Portland, Ore., Rochester, San Francisco, Scranton, Seattle, Spokane, Springfield, St. Louis, St. Paul, Terre Haute, Toledo, Washington, Wilmington. Canadian Headquarters, McKinnon Building, Toronto.

Exclusive selling rights granted where we are not actively represented

Trade Mark

Dictate to the

DICTAPHONE



A CRANK SHAPER of which the manufacturer says: "This machine was finished with your paint and filler, and we believe it is as well finished a piece of work as can usually be found in the machine tool trade."

Good Finishes for Machines and Metal Products

There is much of science in the making of good metal and machinery finishes to secure the proper protection of the surface and to produce the most pleasing appearance.

In the "High Standard" line you will find metal finishes particularly adapted to your needs. Each is scientifically prepared and you get "best results" when you use

Lowe Brothers Machinery Finishes

No matter what your product, from structural steel to the finest machines, we can supply you with the proper finish. Write us your troubles and let us help you solve your finishing problems. Ask for our booklet on Machinery Finishes.

In the Lowe Brothers line there is a Paint, Varnish, Enamel, Stain or Finish for every purpose. Descriptive booklets free on request. Write us at once.

The Lowe Brothers Company

474 E. Third St., Dayton, O.

Boston Chicago
New York Kansas City

Lowe Brothers, Ltd.
Toronto, Canada

The "Little Blue Flag" on the can is always your guide—our guarantee of quality, your certainty of satisfaction.

to the bond issue for paving, there seems now to be only commendation for the promoters of the improvement. Following the special election of November, 1911, when the road bonds were authorized, a sentiment of pride in the improvement rapidly swept over the district. It is almost impossible now to find a man who will acknowledge that he voted against the good roads project. During the campaign preceding the last regular election to fill county and district offices, nearly every candidate claimed loudly the honor of having been the originator of the plan to pave the roads.

The heavy rains of the last month have retarded greatly the work on the improvement of the roads by washing out the sand and gravel spread in place ready for the laying of bricks. The loss, which amounts to several thousands of dollars, will have to be borne by the contractor. Had the weather been dry during the last month several miles of pavement would have been in place by this time.

The International Congress on Hygiene

A Review of a Remarkable Convention

THE Fifteenth International Congress on Hygiene and Demography, which closed its sessions at Washington, D. C., on the 28th of last month, was the first to assemble on United States soil, and is generally admitted to have been, in some respects at least, the most important held so far in the history of the institution. In no other meeting of the congress have there been communications so promising for the future of hygiene, while several of the discoveries brought to the attention of the delegates are in themselves notable advances in biological and medical science. Among these is the discovery by Dr. Frederick Novy, of the University of Michigan, of a micro-organism which may prove of value in checking the bubonic plague. Next, if not equal, in importance are the discoveries that typhus germs are carried upon the bodies of certain parasitic insects, and that the germs of measles may be disseminated not only by desquamation, as has been believed, but also by sneezing.

The gathering, presided over by Dr. Henry P. Walcott, of Massachusetts, included representatives from every civilized nation, numbering about 3,000, probably the most noteworthy scientific assembly ever seen in the national capital.

Insects and Books as Disease Carriers.

It was on this first day of the congress that Dr. Frederick G. Novy announced his discovery of a micro-organism which he regards as possibly of high value in dealing with the bubonic plague. It is peculiarly fatal to rats, the generally acknowledged carriers of the bubonic plague, and plainly suggests a means of exterminating those rodents. Drs. John F. Anderson and Joseph Goldberger, of the United States Public Health Service, announced, among other discoveries made in the course of experiments on monkeys, that they had traced typhus fever to an insect—the louse—as a carrier, and that their investigations along this line had disclosed nearly 300 cases of the disease in New York city, as well as many others in Chicago, Philadelphia, Baltimore, and Washington, although it was thought that typhus had not visited America for some years.

In the section of hygienic microbiology, William R. Reineck, of Philadelphia, speaking of books as disease carriers, said that analysis of dust taken from books lying untouched for forty years in Florida, showed that it contained diphtheria, typhus, blackleg, and tuberculosis bacilli.

Water and Food Supply.

An interesting discussion was the sequel of a paper read on the second day by Prof. Edwin O. Jordan, of the University of Chicago, on the Purification of Drinking Water. The emphasis laid by Prof. Jordan upon bacteriological tests for the detection of typhoid germs elicited a protest from Dr. August Gaertner, of the

Decay Is Eating
The Heart Out of Your Tires
To explain: Here's a cut in the tire, extending through the rubber surfacing to the real body of the tire. This body is built up of plies of heavy cotton fabric. Oil gets into the cut—moisture is almost continuously seeping in and soaking the fabric—decay follows. Any cotton fabric subjected constantly to moisture will rot. There are many such cuts in every tire—each a decay spot. No tire can stand up long with its body so weakened. Result—blow-outs, rim-cuts, shortened tire life. Tirenew is the preventive.
You'll get 20 per cent more mileage out of your tires by using
TIRENEW
TRADE MARK
Narco Product
It Prevents Tire Decay
A liquid, unvulcanized rubber compound with a base of pure gum. It puts a protecting coat on the tire which will not rub or wash off, and it gets down into all cuts and cracks and thoroughly waterproofs the fabric—it protects the entire tire from oil, moisture, light and sun; and
It Makes the Tire Look Like New
Tirenew your tires once a week and you'll have a smarter looking car, and longer lived, safer, and more satisfactory tires. Tirenew your spares and protect them from light and sun. Two colors—tire gray and white.
There are imitations which paint but don't protect—insist on Tirenew.
Ask Your Supply House
National Rubber Company, 4405 Papin St., St. Louis, Mo.
A Trial Can—Send 25c in stamps for a trial can—contains enough to Tirenew one tire. Apply it to your spare tire for its protection and appearance. Give dealer's name and address and state which color you want—tire gray or pure white.
Buy by the Box—Buy a box of ½-gallons—convenient and economical. If your dealer can't supply you we will.
TIRENEW

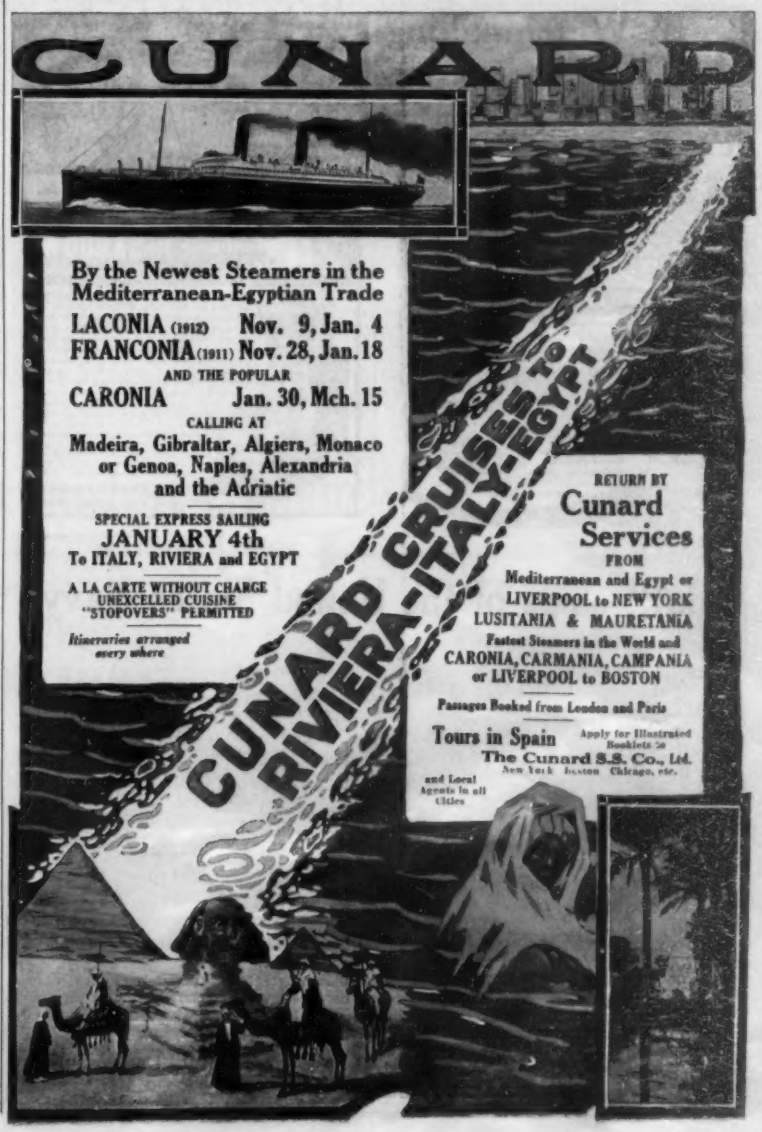

CUNARD
By the Newest Steamers in the Mediterranean-Egyptian Trade
LACONIA (1912) Nov. 9, Jan. 4
FRANCONIA (1911) Nov. 28, Jan. 18
AND THE POPULAR
CARONIA Jan. 30, Mch. 15
CALLING AT
Madeira, Gibraltar, Algiers, Monaco or Genoa, Naples, Alexandria and the Adriatic
SPECIAL EXPRESS SAILING
JANUARY 4th
To ITALY, RIVIERA and EGYPT
A LA CARTE WITHOUT CHARGE
UNEXCELLED CUISINE
"STOPOVERS" PERMITTED
Itineraries arranged every where
CUNARD CRUISES TO RIVIERA-ITALY-EGYPT
RETURN BY
Cunard Services
FROM
Mediterranean and Egypt or
LIVERPOOL to NEW YORK
LUSITANIA & MAURETANIA
Fastest Steamers in the World and
CARONIA, CARMANIA, CAMPANIA
or LIVERPOOL to BOSTON
Passages Booked from London and Paris
Tours in Spain
Apply for Illustrated Booklets to
The Cunard S.S. Co., Ltd.
New York Boston Chicago, etc.
and Local Agents in all Cities

Photo of Fire Apparatus in Springfield, Mass., driven by U-S-L Batteries

Where the Test is Severest

Storage USL Battery

THE UNITED STATES LIGHT AND HEATING CO.

(Formerly National)

The demand for speed and power, for sustained voltage dependability and general high efficiency, has led to the selection of the U-S-L Storage Battery for every important installation of electrically-driven fire equipment in the United States.

In Springfield, Mass., four pieces of apparatus—weighing from 7½ to 10 tons—are propelled from 23 to 36 miles an hour by U-S-L Batteries. Endorsing their service, Chief Engineer W. H. Daggett says: "The apparatus has not been an hour out of service on account of battery trouble since installation, and after two years of service the plates show scarcely any sign of deterioration. I can say that our experience with U-S-L Batteries has thus far been very pleasing and altogether satisfactory."

If you use or contemplate purchasing an electric truck or pleasure car, and want *Fire Department dependability*, insist on the installation of the U-S-L Battery.

On every point of economy, general merit and performance, it challenges comparison with any other storage battery in the world, regardless of name or type.

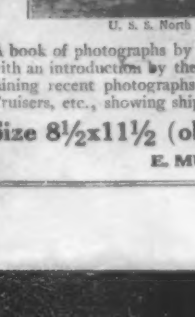
U-S-L Service

means active co-operation of our experts who work from eight service stations in large cities. All stations carry extra parts.

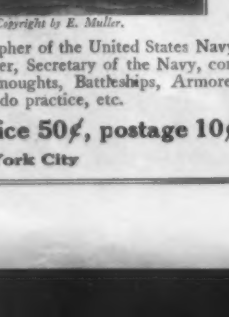
Write for Information

The U. S. Light & Heating Co.

General Offices: 30 Church St., New York
Factory: Niagara Falls, N. Y.
Branch Offices and Service Stations: Chicago, New York, Boston, Cleveland, Buffalo, San Francisco, Detroit, St. Louis


U-S-L Battery-Driven Apparatus in New York Fire Department

Manufacturers also of the U-S-L Electric Starter and Lighter for Gasoline Automobiles

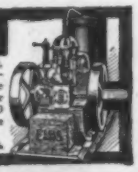

U-S-L Battery-Driven Apparatus in Springfield, Mass., Fire Dept.

Learn Watchmaking

We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Easy terms. Send for catalog.

ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Missouri

ELLIS ENGINE



Run on gasoline, kerosene, distillate, any cheap fuel oil. Cost less to run—develop more power. Patent throttle gives *three engines in one.* Many other exclusive features—guaranteed 10 years—we pay freight—30 days' free trial. Send for catalogue today.

Ellis Engine Co., 52 Mullet St., Detroit, Mich.

It's Easy to Buy a Kalamazoo Furnace

Cash or Credit—30 Days FREE

We prepay freight on the splendid Kalamazoo furnaces with complete fittings all ready to install. We tell you how to put it in. You can do the work yourself if you wish. Best heater—easiest to buy. Backed by $100,000 Bank Bond Guarantee.

TRADE MARK REGISTERED

A Kalamazoo Direct to You

Save $25, $50, $75

Write for Free Book of Furnaces showing how you can heat your entire house better than ever before, at lowest cost. Don't think of buying a heating system until you know the Kalamazoo furnace and offer. Write postal today for catalog No. 346.

Mention this paper.

Kalamazoo Stove Co., Manufacturers, Kalamazoo, Mich.

We also make heating and cooking stoves and gas ranges. Catalogs on request.

Factory Price Book 400 Stoves

Book Free

20 Reasons Why You Should Investigate the SANDOW Kerosene Stationary ENGINE

It runs on kerosene (coal oil), gasoline, alcohol or distillate without change of equipment—starts without cranking—runs in either direction—throttle governed—hopper cooled—speed controlled while running—no cams—no valves—no gears—no sprockets—only three moving parts—portable—light weight—great power—starts easily at 40 degrees below zero—complete, ready to run—children operate them—5-year ironclad guarantee—15-day money-back trial. Sizes 2 to 20 H. P. Send a postal today for free catalog, which shows how Sandow will be useful to you. Our special advertising proposition saves you one-half cost of first engine sold in your county. (167)

Detroit Motor Car Supply Co.
162 Canton Ave., Detroit, Mich.

Battleships of the United States Navy

U. S. S. North Dakota, firing a salvo of ten 12-inch guns.—*Copyright by E. Muller.*

A book of photographs by E. Muller, Jr., Official Photographer of the United States Navy, with an introduction by the Honorable George Von L. Meyer, Secretary of the Navy, containing recent photographs of all the United States Dreadnoughts, Battleships, Armored Cruisers, etc., showing ships in action, battle practice, torpedo practice, etc.

Size 8½x11½ (oblong) **Price 50¢, postage 10¢**

E. MULLER, Jr., Box 530, New York City

University of Jena, who maintained the superior effectiveness of sanitary surveys. To this criticism Prof. Jordan replied, admitting the importance of the sanitary survey so far as it went, but denying its sufficiency apart from bacteriological examination. Dr. Gaertner also took issue with Dr. A. C. Houston, director of the Metropolitan Water Board of London, on the Purification of Water by Storage, and questioned the claims of certain French scientists for the purifying power of the ultra-violet rays.

In his address on "The Nutriment of the People," Prof. Max Rubner, speaking from his experience of German dietetic habits, said that the increased cost of living and social ambition were both telling upon the population of his own country. He said:

"One of the greatest, if not the greatest, of problems now confronting mankind is that of providing the race with proper nourishment. It is of such importance, in fact, that every large city should have a department in its government clothed with plenary powers of caring for this branch of the people's welfare. Changed conditions in the last half century have brought the question of feeding the human race to a critical point. The growth of the cities and of the industrial workers as a class has complicated the problem to a point where it is becoming necessary for the city governments to maintain a jealous watch that all of their citizens receive the proper nourishment."

After urging that ill-nourished children should be fed by the public school authorities, Dr. Rubner continued:

"There has been a distinct step backward in the organism of the workingman. This is due to two causes: First, insufficient nourishment, and, second, the fact that the new era of machinery has specialized and confined his physical exertions so that he gets little or no natural exercise."

Hygiene of the Very Young.

A paper by Augustin Ray, a distinguished French architect, read by Mr. Adolphe Smith, of the London *Lancet*, before the section of school hygiene, insisted upon the importance of ultra-violet rays to human health. We cannot demand too forcibly, Mr. Ray thinks, that ultra-violet light shall be largely admitted into dwellings as a factor of microbian purification. In killing the microbes, we incidentally preserve the eyesight of the children, and for this purpose the windows of school buildings should be specially constructed: "No classroom is satisfactory that is not well disinfected by the direct rays of the sun." Private speculation in land, therefore, should, in the opinion of Mr. Ray, be checked.

Dr. C. Ward Crampton, director of Physical Training in the New York Public Schools, advanced the theory that school children should be classified rather by their physiological development than by age, in order that appropriate treatment may be applied to the mature and the immature. Dr. Caroline Hedger, of Chicago, presented a strong plea in her address on "The School Children of the Stock Yards District."

Industrial Dangers.

Henry Japp, of the American Society of Civil Engineers, plausibly advocated the adoption of the medical air-lock in all caisson workings, asserting that when it was first introduced it brought down the "death rate from caisson disease from 25 per cent to 1 per cent, and in the latest of the large engineering enterprises the death rate has been reduced still further, to nineteen one-hundredths of 1 per cent."

Mr. T. Kennard Thomson, treating the same subject, maintained that many cases of the disease are due to foul air rather than to compressed air, and he cited in support of this view instances which occurred in the construction of the Lenox Avenue Bridge, New York city.

An apparent difference of views developed upon the paper on "Injuries Caused by Electricity," which was presented by Sir Thomas Oliver. This paper included the following directions for first aid to persons suffering from electric shock:

"The first thing a rescuer has to do is to sever the contact by cutting the wire, care being taken to protect the hands by dry cloths. The greatest care must be exercised in re-

New Labor Saving Device

Normal

Absolutely the cheapest and quickest means of fastening all kinds of apparatus to Concrete, Brick, Stone, Marble, Tile, Floors, Walls, or Ceilings.

SCIENTIFIC PRINCIPLES of expansion compels the

VAN EXPANSION BOLT TO HOLD

Costs no more than the cheapest.

Impossible to design a bolt more easily handled.

Write to-day for booklet: "Expansion Bolt Facts" and free working sample.

Expanded

THE VAN EXPANSION BOLT COMPANY
1209 D. Fort Dearborn Bldg. Chicago, Illinois

PHOTOGRAPHY SIMPLIFIED

TRADE MARK 'TABLOID' BRAND 'RYTOL' TRADE MARK

UNIVERSAL DEVELOPER

Matchless for plates, films and papers

Carton: 35 cents, of all Dealers

Specimen mailed free for 2 cents

BURROUGHS WELLCOME & Co.
35, West Thirty-third Street, New York City
Montreal: 101, Coristine Building

Does Your Engine Overheat —Your Radiator Boil?

Remove the cause of all this trouble—remove the rust and scale from your radiator and water cooling system—make your engine "pull" **like new** with

Apex Radiator Cleanser

Investigate at once this new scientific **oil** mixture endorsed by auto manufacturers, garage men and dealers. Find out how easily and economically you can (first) **remove** and (thereafter) **prevent** rust and scale from clogging and eventually ruining radiator and water system. Get increased engine efficiency and **keep your water system clean and bright as new** with Apex Cleanser. Read how A-R-C makes a

***Perfect* ANTI-FREEZE Solution** at minimum cost.

Ask your dealer for Apex Cleanser. If he can't supply you, send us your name and his name and address for a full sized can on trial prepaid. After 30 days, send us $3.00 if you are satisfied. If not, write us so and return what's left.—We'll charge you nothing.

Full Size Can Sent Prepaid For Trial

Descriptive folder mailed **free on request.**

U. S. COMPOUND CO., BUFFALO, N. Y.

Dealers! Write for attractive proposition.

PALMER MOTORS AND LAUNCHES

2 AND 4 CYCLE

Catalogue M Free of Motors.
Catalogue B Free of Boats.

ENGINES FROM 2 TO 40 H.P. IN STOCK

PALMER BROS., Cos Cob, Conn.

Convert Your Bicycle Into a Motor-cycle with our Attachable Outfits. Fits any wheel. Also Marine and Stationary Castings. Stamp for catalog. STEFFEY MFG. CO., 2341 W. Girard Ave., PHILADELPHIA, PA.

Incorporate Your PATENTS and BUSINESS in ARIZONA

Laws the most liberal. Expense the least. Hold meetings, transact business anywhere. Blanks, By-laws, and forms for making stock full-paid for cash, property or services, free. President Stoddard, FORMER SECRETARY OF ARIZONA, resident agent for many thousand companies. Reference: Any bank in Arizona.

STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

Jaeger Sanitary Goods

The celebrated Jaeger Underwear is suitable alike for men, women and children, and for all conditions of health and occupation. Recommended by the Medical Profession everywhere.

Explanatory catalogue and samples free on request.

Dr. Jaeger's S.W.S.Co.'s Own Stores
New York: 306 Fifth Ave., 22 Maiden Lane
Brooklyn: 504 Fulton St. Boston: 324 Boylston St.
Phila.: 1516 Chestnut St. Chicago: 126 N. State St.
Agents in all Principal Cities

Get it for $90

Save Time and Money

Not a cheap machine, but made inexpensive by quantity production, scientific shop management and special machinery. The Niagara produces *absolutely perfect* typewritten letters from 7 to 1400 copies per hour. Other forms may be printed such as time cards, report and memorandum slips for your factory and office, notices to salesmen and clients, stock quotations, price lists, notices of meetings, instructions, etc., at a saving of 40% of present cost.

Ten Day Trial to Responsible Parties

Model A $90.00, Model B $145.00. Both models are equipped with ball bearings, metal type, counter and other high-class features.

We have a special proposition to offer user-agents where we are not represented. Order now or write for more details at once to the Home Office.

NIAGARA MULTIPLE TYPEWRITER CO.
Niagara Falls, N. Y.

Can you find your Blue Prints instantly?

The "Y and E" Flat File is an air tight, dust proof cabinet which holds large size prints, flat, filed vertically in manila folders, and indexed. Each print is as accessible as a letter in your correspondence file.

A booklet is free to those who ask for it on their business stationery.

YAWMAN AND ERBE MFG. CO.
448 St. Paul St., Rochester, New York

Smoke Five With Me

Here is the sweetest smoke that I ever knew, and I've smoked for 40 years.

It was handed me once by a connoisseur, who told me where to get it. Later I had it made especially for me—made as a Panatela, the size of this picture, for a short, sweet smoke. It is made from Havana leaf. So are many others. But I call this the finest-flavored leaf that ever came from Cuba.

All my friends think likewise. Now I order these cigars in 50,000 lots to keep my friends supplied.

It occurs to me now that countless men would be glad to share this discovery. I am going to let some of them do it. Not for profit so much as a hobby.

I will supply a few men, who love good cigars, at **$4.50 per hundred,** mail or express prepaid. That's not far from my cost.

If you must have big, heavy cigars, these won't please you. These are for men who like mild and exquisite smokes. I have never tasted anything like them.

Five Cigars Free

I will send to 500 men five cigars free. Just send me 10 cts. to cover postage, packing and revenue stamp. I will supply the cigars. I only ask this 10 cts. to pick out the right sort of people.

If you like them, order as wanted—50 or 100 at a time. I will send them prepaid at $4.50 per hundred (fifty for $2.35).

Write now for the five cigars

J. ROGERS WARNER [9]
600 Marine Bank Building, Buffalo, N. Y.

moving the body from the live metal, and especially if the workman's clothes are damp. India rubber gloves are the best protective. When the body has been removed from contact it should be placed upon its back, medical assistance sent for, and artificial respiration should at once be started and continued for a long time."

Dr. J. D. McGowan, surgeon of the Commonwealth Edison Company of Chicago, was inclined to a more optimistic view of the accidental dangers of the electric current than had been taken by Sir Thomas at the opening of his paper. Dr. McGowan declared that, among hundreds of cases of shock within his observation, where immediate death had not taken place, the patient never suffered except from the local effect of the burns. The impression that such shocks cause paralysis and brain lesions, where they do not instantly kill, is, he asserted, erroneous.

Human Vehicles of Disease.

Wednesday, the third day of the congress, brought with it discussions of unusually wide interest. Among them were those which followed the papers on infectious diseases, read by Drs. J. C. Ledingham, of the Lister Institute, London, and William Lorenze Moss, of the Johns Hopkins University. The case of "Typhoid Mary," it appeared, had attracted much professional attention on the other side of the Atlantic; but it was not unique. Dr. Charles Boldman, of the New York city Department of Health, said:

"Typhoid bacillus carriers have a very large share in producing typhoid infections in New York city. In particular, great importance attaches to the chronic typhoid bacillus carrier employed in dairying. One such carrier studied by me caused over 300 cases of typhoid fever in New York. It is now agreed that no known typhoid carriers should be allowed to engage in dairying. The great difficulty at the present time is the recognition of these carriers, and this, like many other public health problems, is largely a question of expense."

Dr. Fornet, of Berlin, argued that the campaign against typhoid begun in Germany eight years ago has shown that the disease sticks to the place where it has once occurred. He added:

"The fact that I could trace thirty-one families where two or even more members were typhoid-hosts makes it likely that a second infection with typhoid bacilli often makes people become bacilli carriers, a theory I could verify by experiments on beasts. Cleanliness alone can do much in preventing this undesirable state of the body."

Dr. A. C. Abbott, of Philadelphia, said that in his city the authorities, having examined every child in a certain school situated in a district of 15,000 inhabitants, found thirty bacillus carriers among the pupils, sent them home, and in this way put an end to an epidemic of diphtheria which had already made some headway.

The Brass Founder's Perils.

Statistics gathered by the Illinois Commission on Occupational Diseases show that in 1910 only 17 out of 1,761 brass founders in Chicago were over 50 years of age, while less than 15 per cent were over 40. Investigations made in England a few years ago developed the fact that only 10 brass founders out of 1,200 were over 60 years of age. Dr. Emery R. Hayhurst, after speaking of the more general sanitary conditions of this occupation, discussed more particularly the disease known as "brass founders' ague," which a German investigator, Lehmann, has traced to the inhalation of zinc fumes. Dr. Hayhurst, in maintaining the thesis that these specific occupational maladies are preventable, said that the workers "must not breathe an atmosphere laden with zinc or other metallic fumes. Brass chills practically never occur in spacious, well-ventilated foundries or smelters. Higher ceilings, more partitions, better eating and sanitary quarters, better natural ventilation, and artificial ventilation for the pouring hours, especially in winter time, are all that are required. There are no antidotes for brass founders' ague. The workmen's remedy, whisky, is worse than useless; all is prevention."

Two topics of sensational interest to the general public treated on this day were the victorious war carried on by the United States authorities in Porto Rico

Mack
Proved by 12 years of real use

Saurer
Proved by 18 years of real use

Hewitt
Proved by 10 years of real use

"Leading gasoline trucks of the world"

Henry Hanlein & Sons, well known contractors of New York, have displayed six double teams with one of our 5-ton trucks

Modern Business

The right motor-truck — the right one — enlarges the scope of business and makes it more effective. In this connection we offer:

1. A truck for every need of every industry. Capacities of 1, 1½, 2, 3, 4, 4½, 5, 6½, 7½ and 10 tons, with every method of load distribution, and bodies adapted to all kinds of business.
2. Trucks that have already earned their owners more than the investment.
3. Help in your transportation problem.

Inform yourself what motor-transportation with International trucks means to your business.

International Motor Company

General Offices
Broadway and 57th St New York

Works
Allentown Pa; Plainfield N J

Sales and Service Stations: New York, Chicago, Philadelphia, Boston, Cleveland, Cincinnati Buffalo, Baltimore, Newark, Pittsburgh, St Louis, Atlanta, Kansas City Denver, San Francisco, Los Angeles and other large cities

Canadian Sales Agents: The Canadian Fairbanks-Morse Co, Limited, Montreal

Fireproof Garage $100 up

One year's saved Garage Rent often covers the cost of a

"Pruden System" Garage

Public garages have heavy overhead expenses. They have to require high rents of their patrons. You do away with paying not only rent, but a good many incidental expenses as well, by having your own garage. Your car is always handy and safe in a

Pruden System

Portable Fireproof Garage

It insures you against loss by fire, weather or vandals. No wood. Indestructible. Entirely fireproof. Built of metal units which interlock and support each other, without framing. Easy to erect. No experience necessary. A matter of only a few hours. Strong, durable and handsome as masonry. Costs far less. First cost the last cost. No repairs or upkeep expense. No painting even, unless to match nearby buildings. The Pruden System is the standard fireproof garage. In successful use over three years.

Write for catalog, stating name and model of car so we can advise size and style garage to best suit your needs. Prices $100 and up. *Immediate shipment from stock.* Freight prepaid east of Rocky Mountains.

METAL SHELTER CO.
5-52 W. Water St. St. Paul, Minn.

Order NOW and save winter storage

When price tempts you to buy cheap tools—don't do it. The good carpenter doesn't buy a cheap saw, and no one else should.

If you are a house owner, you'll find your household will be neater aud better "kept up," if you own a few tools, especially a good saw.

Don't buy a cheap one. In a

SIMONDS SAW
(Pronounced Si-monds)

you get teeth which hold their edge and set against long, hard use. They cut true and fast, long after the cheap saw has lost what little edge it had.

It's the Simonds Special Crucible Steel which makes Simonds Saw teeth stand the wear. Our special process gives a uniform temper and a toughness you don't find in other saws.

Simonds Saw handles are shaped right and properly set on the blade and the saw has an easy, comfortable "hang" that even the amateur recognizes.

Ask Your Hardware Dealer

Remember Simonds Hack Saw Blades and Files are most efficient. Simonds Circular, Band and Cross-cut Saws are the American and Canadian lumbermen's accepted standard.

Send for "A Carpenter's Guide Book"—Free—and read about filing hand saws.

SIMONDS MFG. CO. (Founded 1832) **Fitchburg, Mass.**
Chicago New Orleans Portland New York
San Francisco Seattle Montreal Lockport, N. Y.

We Want To Send You A Free Sample

The illustration shows a corner in the beautiful country home of a prominent United States Senator. The house is finished throughout with

Utility Wall Board

Utility Wall Board takes the place of both lath and plaster. It is very tough and durable. Will not warp or crack or shrink. It is nailed direct to the studding. Very easy to put on. May be decorated in any way desired.

A Sample and the Booklet Free to Every Home Owner. Write for Yours.

THE HEPPES COMPANY, 4518 Fillmore St., Chicago, Ill.

REYNOLDS' PAT. "O.K." INK-WELL

This Type of Ink-Well has been "Called for Times Without Number" but has Never Before Been Produced at any Time or any Place.

GUARANTEED A LIFETIME AND TO ALWAYS WORK

All glass. Nothing to corrode or get out of order. Two depths of ink. *(A feature which no other ink-well has)* one for stub pens, one for ordinary long pens. EASY TO CLEAN, EASY TO FILL.

Makes writing a pleasure, seldom needs refilling and saves over one half the item of ink cost.

You must SEE and TEST this ink-well in order to realize WHY it is the one "CALLED for times without NUMBER."

Sent prepaid on receipt of $2.00, introduction price. Booklet FREE.

After ten days' trial, if it proves unsatisfactory return the ink-well and your money will be cheerfully Refunded. *All Stationers.*

LIBERAL DISCOUNT TO THE TRADE

THE O.K. MFG. CO., Syracuse, N.Y., U.S.A.

VENUS PERFECT PENCILS

Free Sample

Prove for yourself Venus Pencils are best. Write for Free Sample. Ask for soft, medium or hard.

VENUS PERFECT PENCILS

WRITE SMOOTHEST
WEAR LONGEST
ERASE CLEANEST

17 Black gradations and 2 Copying Absolutely Guaranteed, WRITE

AMERICAN LEAD PENCIL CO.
217 FIFTH AVE. NEW YORK.

Illustrating the newest Haynes Car, Model 22, in the 5-passenger touring type. This car is electrically started and lighted by the most efficient known equipment.

The HAYNES Car

in New York

THE popularity of America's First Car in the nation's metropolis, where competition is keenest and purchasers most critical, is a tribute to Haynes construction and Haynes service—a quality of construction which *you* can secure, no matter where you live, and a character of *service* which is typical of the owners' service rendered by Haynes branches and agents from coast to coast.

Haynes Model 22—the latest Model offered by America's oldest builders—is a handsome, refined, powerful car, more roomy than any other 5-passenger car you ever saw and luxurious in its 12-inch fine hair upholstery. *Details:* Haynes T-head motor, 4½x5½ inches, 40 horse power; wheel base 120 inches; 36x4½ inch tires; famous Haynes contracting steel band clutch; Timken axles and bearings; separate unit electric equipment, starting motor geared to fly wheel; generator for lighting; Eaeman dual magneto for ignition. The equipment is complete and all of the highest standard. *Body types:* 5-passenger touring, 4-passenger suburban, roadster, coupe and limousines. Prices $2250 upward, f. o. b. factory.

Arrange with your Haynes dealer for demonstration or write for Model 22 Catalog

HAYNES AUTOMOBILE CO. 31 Union St. KOKOMO, INDIANA

NEW YORK, 1715 Broadway
CHICAGO, 1702 Michigan Avenue
SAN FRANCISCO, Van Ness Avenue at Turk Street
INDIANAPOLIS, 510-12 N. Capitol Boulevard

against the hookworm, and the appalling statistics of infant mortality. The former was the subject of an address by Dr. Bailey K. Ashford, U. S. A.; in speaking of the latter, Edward Bunnell Phelps, editor of the *American Underwriter*, told the section on demography that the world's infant mortality probably reaches the enormous figure of 40,000 babies' deaths each day, year in and year out, while in the United States the number probably reaches 1,000 a day. Mr. Phelps held that the world's infant mortality can very well be reduced 50 per cent.

Mental Hygiene and Criminology.

On the fourth day of the congress, Dr. Woods Hutchinson, of New York, addressing the section of mental hygiene, claimed to have information that the principals in the famous Los Angeles bomb outrage were victims of hereditary taint. Continuing along this line of argument, the speaker recommended that all children ascertained to be mentally defective should be segregated from the schools. The discussion was further developed by Dr. L. F. Barker, of Johns Hopkins University, president of the section, and also president of the National Committee on Mental Hygiene. Dr. Barker explained the meaning of the National Committee's campaign as "a systematic attempt to secure human brains so naturally endowed and matured that people will think, feel, and act better than they do now."

In his paper on "The Problem of Drunkenness," Dr. Irwin H. Heff, of Massachusetts, dwelt upon the futility of punitive measures. He also insisted that control by State or municipal authorities is necessary to efficiency in the treatment of confirmed drunkenness, and laid down as fundamental in such treatment the following two principles:

"1. A comparatively small percentage of users of alcohol are confirmed drunkards or inebriates.

"2. The appropriate care of the alcoholic implies both curative treatment and custodial care; the curative treatment being directed to the case which is likely to be benefited. The custodial, for economic reasons, should be directed to the recidivist constantly appearing in the courts. Such a differentiation must eventually be made and appropriate segregation of these two types established."

Hygiene of the American Farm.

On the fourth day also the State Health Commissioner of Indiana, Dr. J. H. Hurty, exhibited the sanitary conditions of American farms in a light very surprising to those who have held the conventional opinions of rural well-being. Said Dr. Hurty:

"Most farm houses are unsanitary. In them the farmers and their families experience frequent illnesses and early death. The natural duration of life is realized by only one half on the farm. It is astonishing to note the frequency of the intimate relations of the farm well and the cesspool. The farmer seems determined to locate his cesspool so that its contents will feed the well."

Farm-house cooking, he maintained, is done in dirty kitchens, with the assistance of flies and cats, while the ventilation, in winter at least, is all that it should not be.

Nathan Straus on Milk.

At the Friday sessions Mr. Nathan Straus, the founder of the New York milk depots, spoke on the subject with which his name is so honorably associated:

"It is the duty of the public authorities to see that the milk supplies are pure and wholesome, but it was because the municipal authorities were not alive to their opportunity and their duty that there was place and work for voluntary organizations, and it is because individuals and associations took up this work of protecting the babies that there has at length come a great awakening, and we now have boards of health in hundreds of cities more or less effectively working for the betterment of the milk supplies."

During the summer of 1912, Mr. Straus said, there was but one death among the 22,000 babies supplied from the Straus laboratories; and this one fatality was due to pneumonia.

Anaphylaxis to Infectious Diseases.

A brilliant prospect of victory over typhoid and tuberculosis was revealed in the paper read by Dr. Victor C. Vaughan, of the University of Michigan. Of ty-

BOY SCOUTS—ALL BOYS—TRY 3 IN ONE FREE

"Attention!" We want every Boy Scout and every other boy in America to give 3-in-One a good hard test, *absolutely free.*

Write *today* for a generous free sample and the valuable free 3-in-One Dictionary. 3-in-One has been for over 17 years the leading bicycle oil. It makes all bearings run much easier and prevents wear—cuts out all dirt and never gums or clogs. It cleans and polishes, prevents rust on all metal parts.

3-in-One is also the best gun oil. It oils exactly right trigger, hammer, break joint—cleans and polishes barrels, inside and out; polishes the stock like new, too.

Always use 3-in-One on your ice and roller skates, fishing reels, scroll saws, golf clubs, cameras and every tool you own. A few drops does the work. 3-in-One will keep your catcher's gloves soft and lasting, also prevents rust on your catcher's mask.

3-size bottles at all good stores: 10c, 25c and 50c. (The 50c size is the *economical* size.)

Write for the free sample *today.*

3-in-One Oil Co.
42AZB Broadway, New York

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE.

Electric Time Recorders or Operation Recorders

are cataloged in new Bulletin No. 138 just off the press. Bulletin No. 139 on Bristol's Mechanical Time Recorders also just printed. Write for Bulletins 138 and 139.

The Bristol Co.
Waterbury, Conn.

BUY YOUR FURNACE $10 DOWN $10 A MONTH

Our monthly payment plan of selling direct saves you the dealer's profits and charges for installation. The

Jahant Furnace

with the patented **"Down Draft System"** is best for residences, schools, hotels, churches, etc., because it delivers plenty of heat wherever and whenever desired at a saving of ⅓ to ½ in fuel bills. Install the Jahant yourself. We send complete outfit, freight prepaid with special plans, detailed instructions and all necessary tools for installation. Satisfaction guaranteed or money refunded.

Write for free illustrated book
THE JAHANT HEATING CO., 75 Mill St., Akron, O.

Save ⅓ to ½ on Fuel Bills

VEEDER Counters

Price $1.00

to register reciprocating movements or revolutions. Cut full size. Booklet free.

VEEDER MFG. CO.
18 Sargeant St. Hartford, Conn.

Cyclometers, Odometers, Tachometers, Counters and Fine Castings.

Represented in Great Britain by Markt & Co. Ltd., 6 City Road, Finsbury Sq., London, E.C.; France, by Markt & Co. Ltd., 107 Avenue Parmentier, Paris; Germany, Austria-Hungary and Scandinavian Countries by Ludw. Loewe & Co., Hutten Strasse 17-20, Berlin.

Two Cents a Week Pays Wash Bill!

This Washer eliminates *labor* and practically saves all *cost.* Does a big family washing for *2 cents a week*—yes, and the *wringing*, too. It's one of the greatest marvels the world has ever known. Runs by electricity or water power. Washes a tubful *spotlessly clean* in two to six minutes! Wrings out the clothes to perfection as fast as you feed them—prove it at our expense.

30 Days' Free Trial

Any Woman Can Have a 1900 Motor Washer On 30 Days' Free Trial

Don't send money. If you are responsible, you can try it first. Let us pay the freight. See the wonders it performs. Thousands being used. Every user is delighted. They write us bushels of letters telling how it saves work and worry. Sold on little payments. Write for fascinating Free Book today. All correspondence should be addressed to **1900 Washer Co., 5007 Court St., Binghamton, N. Y.** If you live in Canada, address Canadian 1900 Washer Co., 355 Yonge St., Toronto, Canada.

The Thing That Makes a Pen Write

Keeps the Parker From *Leaking*

WHEN you set an ordinary fountain pen in your vest pocket, point up, most of the ink runs down into the reservoir below. But some always stays in the feed tube.

When your body heat—98 degrees—reaches the air in the pen, the air expands—pushes up through the inky feed tube—pushes the ink up and out—messes the writing end of the pen, and *blacks your fingers* when you remove the cap.

That is why ordinary fountain pens leak and smear.

Now the Parker, unlike other fountain pens, has a *curved* feed tube. The end touches the barrel wall. This touch creates Capillary Attraction. This Capillary Attraction draws all the ink down out of the feed tube before the expanding air goes up.

That is why the Parker does *not* leak and smear. The curved feed tube is the famous Lucky Curve.

And when you turn the pen down to write, the touch of the pen point to the paper creates Capillary Attraction too, which draws the ink down on the paper.

Thus the thing that makes a pen write is the same thing that keeps the Parker Pen from leaking—to wit: Capillary Attraction.

14k gold pens with hardest Iridium points make Parkers write without scratching or "kicking." Parker Spear Head Ink Controller won't let the ink flow too fast or too slow.

Standard style Parker Lucky Curve Fountain Pens $1.50 to $250.00, according to size and ornamentation.

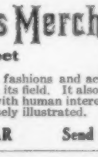
PARKER
LUCKY CURVE
FOUNTAIN PEN

New Parker Jack Knife Safety Pen *can't leak in any position*, in any pocket. Comes also in pen knife sizes for lady's purse. $2.50 up.

New Parker *Disappearing* Clip clinches like a drowning man, but *disappears* when you write.

If your dealer doesn't sell Parkers, send us his name. We'll send you complete catalogue and fill your order direct. If he does sell Parkers, get one on trial. Use it 10 days. If it should leak or not be what you expected, take it back. Dealer will quickly refund.

Nothing like getting a Parker today.



PARKER PEN COMPANY
65 Mill Street Janesville, Wisconsin
New York Retail Store
11 Park Row Opposite Post Office

CORRECT INFORMATION is a vital necessity to every man in the dry goods trade. His success absolutely depends upon it. The

Dry Goods Merchandiser
15 E. 26th Street New York

authoritatively forecasts fashions and accurately reports all wholesale markets within its field. It also publishes a raft of special articles teeming with human interest, yet of practical help to the trade. Profusely illustrated.

ONE DOLLAR A YEAR Send for Sample Copy

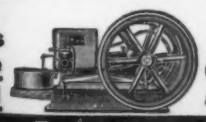
GET YOUR SHARE

Large profits—easiest—fastest—biggest seller on the market today. National Self-Heating Gasoline Iron sells everywhere—town or country. Join our force of enthusiastic agents now. No time to lose. Complete demonstrating outfit, $4.50. Write for the facts.

National Stamping & Electric Works
402 S. Clinton Street, Chicago, Illinois

ELECTRIC MOTORS
Dynamos
SPECIAL Grinders
MACHINES Polishers
ROTH BROS. & CO.
198 Loomis Street, Chicago, Ills.

60 Days Free Trial



5 Year Guarantee

Cuts Fuel Bills in Half

Wholesale Prices on the Witte Gasoline Engine—for 25 years pacemaker for other makes. Always before sold through dealers—now *direct*—you get dealer's profit. Also extra big saving due to our own gas well. No power, heating, lighting, or testing fuel expense.

Famous WITTE

has 61 points of superiority—*full power on minimum fuel guaranteed.* Write for Engine facts.—*Get complete offer.* Free trial, guarantee and unequalled prices. Sizes 1½ to 40 H. P. Mention power needed.

WITTE IRON WORKS CO.
1775 Oakland Avenue, Kansas City, Mo.

Now Sold Direct

phoid Dr. Vaughan pointed out that the period of incubation lasted about ten days. Then comes the period when "the onset of the disease manifests itself. This marks the time when the body cells have been sensitized, beginning to elaborate in active form a secretion which splits up and destroys the typhoid bacilli. This continues during the course of the disease. In splitting up the invading organism the protein poison is set free, and this is accountable for the symptoms and lesions of the disease. If the poison is set free too rapidly the temperature falls and death results. This is practically what occurs in every infectious disease, whether it be of bacterial or protozoal origin." Dr. Vaughan went on to adumbrate a process by which the cells of the body can be trained to grapple successfully with this poison. If his conclusions are verified in practice, a means will have been found to resist typhoid and other infectious diseases, just as effectually as we now resist smallpox. "At the cost of untold sickness and numberless deaths," he said, "the white man is becoming immune to tuberculosis, but this increasing resistance may be strengthened by the general use of vaccine. A perfectly harmless and efficient vaccine can be obtained. Not only will this prevent tuberculosis and other diseases, but it will cure them."

Final Sessions.

The final day of the fifteenth congress was marked by the passage of resolutions, among which was one approving a proposal for an international committee to promote a uniform classification of colon bacilli. The most important recommendations were: An international agreement to secure uniformity in the reporting of occupational diseases; greater uniformity in medical department reports of the navies of the world as to causes of disability or death; an international agreement on the manner of collecting reports on marriages, births, deaths, and divorces, and that such reports, when made, shall conform to a uniform standard, and be periodically published; a commission to secure uniformity in criminological statistics; lastly, that the permanent International Committee be instructed to establish a permanent bureau for future congresses, such bureau to be established in the near future, with headquarters at The Hague.

No definite arrangement was made as to the place of meeting of the next congress (1915). A strong tendency was manifested to accept the only invitation thus far extended, that of the Brazilian government; but the general feeling eventually proved to be opposed to two successive gatherings in the New World, and Russia would have been decided on as the next rendezvous, but that the invitation of the Czar's government had not reached Washington when the congress adjourned.

Daniel Webster on Patent Property

OUR attention has been called by George D. Seymour, Esq., of the New Haven Bar, to the able argument of Daniel Webster in the suit brought by Charles Goodyear vs. Horace H. Day in the U. S. Cirsuit Court, District of New Jersey, for the infringement of Goodyear's patents of 1839 and 1849 for Improvements in the Vulcanization of Rubber.

Mr. Webster appeared as counsel on behalf of the complainant and the extract from his argument which is here reproduced shows that this learned statesman as far back as 1852 had the right conception of the protection to patent property rights which the framers of the Constitution intended to secure to inventors. As pointed out by Mr. Webster, it was not the intention of the framers of the Constitution to grant monopolies, that is, to restrict and confine to a few, rights which had theretofore belonged to all, nor to actually grant property rights, but the intention was to secure for a limited time the exclusive right of property in something that had never existed until the inventor produced it, and which but for his efforts would perhaps never have been known.

Mr. Webster, it seems to us, has clearly

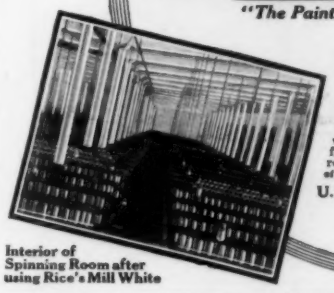
Interior of Spinning Room before using Rice's Mill White

Rice's Mill White vs. Cold Water Paints

No cold water paint can give permanent results. Such a paint dries flat and lustreless; is porous; gathers dust and germs; is uncleanable and soon flakes. Rice's Mill White, on the contrary, is firm, glossy, easily cleaned and under ordinary conditions will not yellow—*it stays white longer than any and all other gloss whites.*

RICE'S MILL WHITE
Not a Cold Water Paint

"The Paint that Brims Over with Sunlight"



Interior of Spinning Room after using Rice's Mill White

possesses an *elastic quality* that makes *cracking and scaling an impossibility.* This is the result of a secret process of treating the vehicle which also causes Rice's Mill White to flow freely and greatly increases the economy of its use.

If you have 20,000 or more square feet of ceiling and wall space to cover, write us on your letterhead for a free sample board showing its fine surface and high reflective power, and our booklet, "Make the Most of Daylight in Your Plant." Address

U. S. GUTTA PERCHA PAINT CO.
Dudley St., Providence, R. I.
Originators of the Mill White Idea

$3.00 M. I. P. KEY FILING MACHINE

Makes every Known Pin Tumbler Key in a minute; absolutely accurate. Best Key Filing Machine at any price. Master Mechanics, Superintendents of Buildings, Hardware Stores, etc., cannot afford to be without this tool. Send for circular and testimonials or $3.00 for machine complete.

HARRISON & CO., 85 New St., New York

Carpenters, Pattern and Cabinet Makers Annihilate time by using

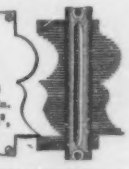
REINHARDT'S PROFILE GAUGE

TO OUTLINE ALL IRREGULAR SHAPES

Spring Steel Rods Ground to Length 2 1-4 in.

Prices, 2°, 30c., 3°, 45c., 4°, 60c., 5°, 75c., 6°, 90c. By mail or from dealers.

WARREN SUPPLY CO., 85 Warren St., N. Y.



STUDY LAW

High-Grade Instruction by Correspondence

Prepares for the bar. Three Courses: College, Post-Graduate and Business Law. Nineteenth year. Classes begin each month. Send for catalog giving rules for admission to the bar of the several states.

Chicago Correspondence School of Law
506 Reaper Block, Chicago

CRUDE ASBESTOS
DIRECT FROM MINES

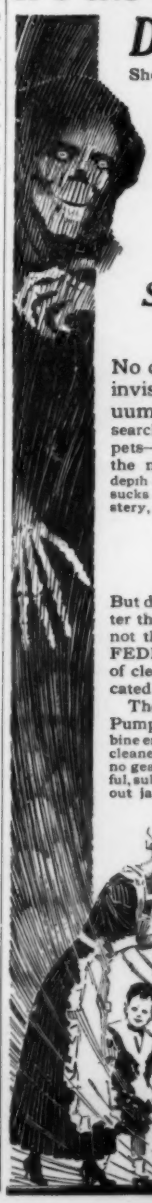
PREPARED Asbestos Fibre for Manufacturers use

R. H. MARTIN
OFFICE, ST. PAUL BUILDING
220 Broadway, New York

It's the Dust You Don't See that Carries Disease—

A clean looking house may still be insanitary. That's the danger of sweeping with a broom.

Shoes collect dried sputum from sidewalks and deposit its dust on rugs and carpets. You can't see it, perhaps. But it's *there.* Then comes sweeping day. Your broom fills the air with invisible, germ-laden dust. It finds its way into your lungs—into your food—settles on the floor where playing children stir it up again and become infected. The *broom* is even more dangerous than the *fly.*



Federal Vacuum Cleaner

Sucks Up All the Germ-Laden Dust

No dirt too heavy—no dust too light and invisible to escape the FEDERAL Vacuum Cleaner. Its powerful suction searches every thread and fiber of rugs and carpets—clothing and drapery. Yet it can't injure the most delicate fabric. From the innermost depth of thick, heavy padding the powerful FEDERAL sucks out the dust and germ-laden air—making upholstery, pillows and mattresses as sweet and clean as new.

The FEDERAL is the Guaranteed Cleaner With the Powerful Rotary Pump

But don't think that just any vacuum cleaner will do this. Some are really no better than a carpet sweeper. They pick up the *surface* dust—the *visible* dirt—but not the hidden, germ-laden dust. You *can't* create a powerful suction, like the FEDERAL, with a *fan* device, a *bellows* or a *diaphragm.* One by one, these types of cleaners are passing into oblivion. You don't want a noisy, rattling, complicated machine that can't do the work—and that soon shakes itself to pieces.

The FEDERAL is the machine that has stood the test of time. The Rotary Pump in the FEDERAL revolves steadily in one direction—like a powerful turbine engine on an ocean liner. It creates a suction impossible with a fan or bellows type of cleaner. Its working parts are few—simple—easy of access. No valves to work loose—no gears to rattle—no piston to pound up and down—no bellows to wear out—just a powerful, substantial pump and a motor—both revolving in one direction—steadily, silently, without jar or jerk.

10 Days' Free Trial—then only $1.75 a week

Wouldn't you like to test the FEDERAL in your own home, free, for ten days? Let it prove our every claim for it. Then—if you are not satisfied, return it at our expense. If you want to own it, pay us only $1.75 a week till paid for. Of all the FEDERAL Cleaners sold not one has been returned for repairs or for failure to do all we claim. Write today for full particulars of this 10-day free trial—$1.75 per week offer. Send the FREE TRIAL COUPON today.

Vacuum Cleaner Department
Federal Sign System
(Electric)
587 Home Insurance Bldg.
CHICAGO

S. A. Oct. '12

SIGN, TEAR OUT AND MAIL

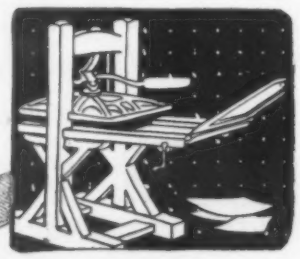
Federal Sign System (Electric)
587 Home Ins. Bldg.
Chicago, Ill.

Kindly send me full particulars of your offer of the FEDERAL on Ten Days' Free Trial. It is understood that this places me under no obligations.

Name .....
Address .....
City .....

West Indies and Panama Canal Cruise
Have you seen the Panama Canal? We have increased our service this season to the
Panama Canal
West Indies, Bermuda and the Spanish Main
to 8 Cruises
by the S. S. Moltke, January 4, 23, February 25, March 29, 1913, and S. S. Victoria Luise, January 15, February 8, March 11, April 10, 1913.
Comprehensive Tour of the
ORIENT
from New York, January 28, 1913, by S. S. Cincinnati (17,000 tons), an 80-day cruise, $325 and up.
NILE SERVICE by superb steamers of the Hamburg and Anglo-American Nile Company.
Orient Cruise
Two Delightful Cruises
Around the World
Sailing from New York, October 18, 1912, Sailing from San Francisco, February 6, 1913, by S. S. Cleveland (17,000 tons), duration 110 days. Cost $550 up, including all necessary expenses aboard and ashore.
Weekly Sailings
To Jamaica and the Panama Canal
Large "Prinz" Steamers
Write for Booklet stating cruise
Deck Sports on the Cruise Around the World
HAMBURG-AMERICAN LINE 45 BROADWAY NEW YORK
Boston Philadelphia Pittsburgh Chicago St. Louis San Francisco

Their past goodness is history — their future goodness is assured by the Liggett & Myers signature.



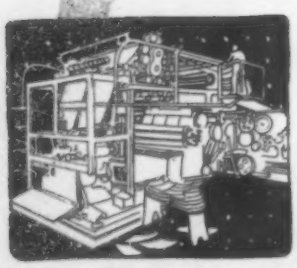
Richmond Straight Cut

Cigarettes Cork Tip or Plain

Favorites for over thirty years

Great presses now pour out THOUSANDS of newspapers for every hundred printed when Richmond Straight Cuts first sprung into popularity.

Still, during all this long period, Man's invention has not been able to produce a cigarette that can supplant Richmond Straight Cuts—the best of all Virginia Cigarettes.



20 for 15c

Liggett & Myers Tobacco Co.

and lucidly pointed out why patent property should be afforded equal protection with other kinds of property and the equities for such protection. A man who clears a part of the wilderness and produces a fertile farm in time acquires title thereto which the courts will protect forever, and while he has by such act advanced the progress of civilization, he certainly has done no more than the inventor to advance the progress of civilization. Surely the inventor is also entitled to that protection which the framers of the Constitution intended he should have for the limited period which Congress has fixed as the term of a patent. Mr. Webster said:

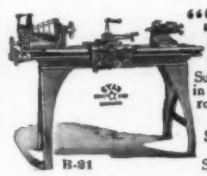
"It is provided in the Constitution of the United States, that Congress shall have power to promote the progress of science and the useful arts by securing for a limited time, to authors and inventors, the exclusive right to their respective writings and discoveries. The law acknowledges the existence of the right of an inventor to his invention as property, and the Constitution is remarkably exact in the language in which it speaks of this important subject. The Constitution does not attempt to *give* an inventor a right to his invention, or to an author a right to his literary productions. No such thing. But the Constitution *recognizes* an original, pre-existing, inherent right of property in the invention, and authorizes Congress to secure to inventors the enjoyment of that right. But the right existed before the Constitution and above the Constitution, and is, as a natural right, more clear than that which a man can assert in almost any other kind of property. What a man earns by thought, study and care, is as much his own as what he obtains by his hands. It is said that, by the natural law, the son has no right to inherit the estate of his father—or to take it by devise. But the natural law gives man a right to his own acquisitions, as in the case of securing a quadruped, a bird, or a fish by his skill, industry or perseverance. Invention, as a right of property, stands higher than inheritance or devise, because *it is personal earning.* It is more like acquisitions by the original right of nature. In all these there is an effort of mind as well as muscular strength.

"Upon acknowledged principles, rights acquired by invention stand on plainer principles of natural law than most other rights of property. Blackstone, and every other able writer on public law, thus regards this natural right and asserts man's title to his own invention or earnings.

"The right of an inventor to his invention is no monopoly. It is no monopoly in any other sense than as a man's own house is a monopoly. A monopoly, as it was understood in the ancient law, was a grant of the right to buy, sell, or carry on some particular trade, conferred on one of the king's subjects to the exclusion of all the rest. Such a monopoly is unjust. But a man's right to his own invention is a very different matter. It is no more a monopoly for him to possess that, than to possess his own homestead.

"But there is one remarkable difference in the two cases, which is this, that property in a man's own invention presents the only case where he is made to pay for the exclusive enjoyment of his own. For by law the permission so to enjoy the invention for a certain number of years is granted, on the condition that, at the expiration of the patent, the invention shall belong to the public. Not so with houses; not so with lands; nothing is paid for them, except the usual amount of taxation; but for the right to use his own, which the natural law gives him, the inventor, as we have just seen, pays an enormous price. Yet there is a clamor out of doors, calculated to debauch the public mind.

"But a better feeling begins to prevail. A more intelligent estimate of this species of property begins to spring up. Yet I am sorry to say, that there have been men, there still are some men in the community, who would not do an immoral action, who would not for their lives 'pick a flaw' in their neighbor's title-deed, and who yet make no scruple of endeavoring by every means in their power to 'pick a flaw' in his patent. That feeling is unjust, illegal, and unsocial."



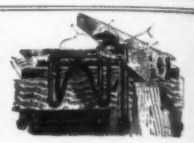
"STAR" Large Line of Attachments
For Foot or Power **LATHES**
Suitable for fine accurate work in the repair shop, garage, tool room and machine shop.
Send for Catalogue B.
SENECA FALLS MFG. CO.
695 Water Street
Seneca Falls, N. Y., U.S.A.
B-91

SEBASTIAN LATHES
9 to 15 Inch Swing
High Quality Low Prices Catalog Free
THE SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

The "BARNES" Positive Feed Upright Drills

10 to 50-inch Swing
Send for Drill Catalogue
W. F. & Jno. Barnes Co.
Established 1872
1999 Ruby Street Rockford, Illinois

The Sawing Angle Isn't Always 45°



Some time you'll want to cut special angles and your mitre box won't have just the cut you want.
"Red Devil"
(Same make as famous "Red Devil" glass cutters)
THE SEAVEY
"RED DEVIL" MITRE BOX will cut any regular or special angle. Weighs two pounds and can be used for either inside or outside work.
If your dealer hasn't it, send us $2.00 and his name.
IT'S ANOTHER OF THE "RED DEVIL" FAMILY
SMITH & HEMENWAY CO.
150 Chambers St. New York City

SOUTH BEND LATHES
Screw Cutting
9 to 13-inch Swing
Power, Foot & Electric Drive
Interesting Catalog Free

South Bend Machine Tool Co., 421 Madison St., South Bend, Ind.

WANTED To manufacture METAL SPECIALTIES, 20 years experience in making Dies, Tools and Special Machinery. Expert work. Complete equipment.
NATIONAL STAMPING & ELECTRIC WORKS
Dept. 2, 412 So. Clinton Street, - Chicago, Ill.

Experimental & Model Work
Circular and Advice Free
Wm. Gardam & Son, 82-86 Park Place, N. Y.

THE SCHWERDTLE STAMP CO.
STEEL STAMPS LETTERS & FIGURES
BRIDGEPORT CONN.

INVENTORS We manufacture METAL SPECIALTIES of all kinds, to order; largest equipment; lowest prices. Send perfect sample for low estimate and best expert advice **FREE**
THE EAGLE MFG. CO., Dept. A, Cincinnati, O.

MODELS CHICAGO MODEL WORKS
ESTABLISHED 1887 155 W. MADISON ST. CHICAGO, ILL.
WRITE FOR CATALOGUE OF MODEL SUPPLIES

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO.,
288-290 Sheffield Ave., Brooklyn, N. Y.

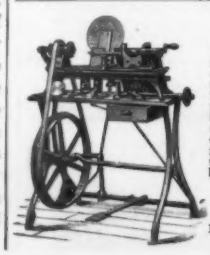
HELHET OIL LUBRICATES ANYTHING SEND FOR SAMPLE FREE
118-124 North Clinton St.
CH. BESLY & CO. CHICAGO, U.S.A.

MASON'S NEW PAT. WHIP HOISTS
save expense and liability incident to elevators. Adopted by principal storehouses in New York and Boston.
Manufactured by VOLNEY W. MASON & CO., Inc.
Providence, R. I., U. S. A.

ICE MACHINES Corliss Engines, Brewers and Bottlers' Machinery
The VILTER MFG. CO.
899 Clinton Street, Milwaukee, Wis.

WE MANUFACTURE FOR YOU
Novelties and Specialties of all kinds by contract. Expert workmen; exceptional factory facilities. Prices reasonable. Write for estimate on your work.
AJAX HARDWARE MFG. CO., 1191 MILITARY ROAD, BUFFALO, N. Y.

IMPROVED Combination Lathe



for mechanics, model makers, experimenters and amateurs. Hollow steel spindle. The foot motion is of the improved grasshopper type. Circular saw has iron saw table perfectly adjusted. Guide and slide move to and fro readily, and are always true to the saw. Slide may be set at an angle.
$45, $50, $55 and $60.
A. J. WILKINSON & CO.
Machinery, etc.
184-188 Washington St.
BOSTON, MASS.

Jackson

NO HILL TOO STEEP
NO SAND TOO DEEP

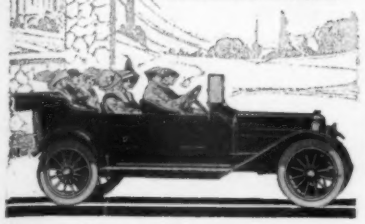
Jackson "Sultanic"

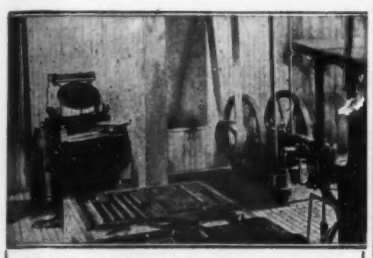
A Six—
Electric starter
Electric lights

5 passenger—$2500
7 passenger—$2650

"Majestic"—four cylinders—$1850
"Olympic"—four cylinders—$1500

Jackson Automobile Company
1316-E. Main St., Jackson, Mich.





BUY AN IHC ENGINE

By far the handiest and cheapest power for a small shop is a dependable oil or gas engine. You have power the instant you need it—you stop expense as soon as the work is done. The operating cost is very low.

Thousands of satisfied owners—model makers, carpenters, plumbers, tin and sheet metal workers, bakers, launderers, printers, confectioners, ice cream manufacturers and men in hundreds of other industries—have I H C oil and gas engines in constant use. You cannot buy a better engine.

Sizes—1 to 50-horse power; tractors, 12 to 45-horse power. Styles—the one to suit your needs. Fuel—gas, gasoline, kerosene, naphtha, alcohol.

The catalogue tells the whole story. Write for it.

International Harvester Company of America
15 Harvester Building (Incorporated) Chicago, U S A

OILDAG
Reg. U. S. Pat. Off.

No other oil lubricant contains Deflocculated Graphite, which graphite is of highest purity and greatest fineness.

One gallon of Oildag will do the work of three or four gallons of oil. It is put up in concentrated form for charging 1, 5, 10 or 50 gallons of oil. You simply mix it with the oil you use regularly. It is very superior for Farm, Factory, Automobile, Motor Boat and Motorcycle use. Ask for Booklet L-458.

ACHESON GRAPHITE

International Acheson Graphite Co.
Niagara Falls, N. Y.

General Agents for Oildag, made by Acheson Oildag Company

Prepare for College at Home

You can prepare for College or complete your high school work at home by our simplified correspondence methods. Our courses meet all entrance requirements; they are written by members of the faculties of Columbia, Cornell, Pennsylvania, Mass. Inst. of Technology, Illinois, Chicago, Michigan and other leading universities. The American School is one of the largest educational institutions in the world and employs no agents, solicitors or collectors. Write for special College Preparatory Booklet.

AMERICAN SCHOOL of CORRESPONDENCE
5765 DREXEL AVENUE CHICAGO, U. S. A.

¶ Will exterminate Rats, Mice and Gophers from your premises in a Safe, Sane and Sanitary Manner.

RAT CORN NO ODORS OR SMELLS

¶ It summifies them. No matter where they die, they simply DRY UP. Positively do not smell. ¶ Rat Corn is a new and scientific discovery, and without a doubt the greatest rat destroyer in the world; the only one that kills rats without any bad, dangerous or disagreeable effects. ¶ A trial will convince you.

25 cents, 50 cents and $1.00 per can
6 lb Pail $5.00 Express Prepaid

¶ Ask your dealer, or sent by mail on receipt of price. We pay postage. Booklet "How to Destroy Rats" FREE with each can.

Made only by

BOTANICAL MANUFACTURING CO.
255 S. Fourth Street Philadelphia, Pa.

After eating Rat Corn he is Mummified

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12686) O. W. La C. asks: Being interested in taking up mechanical engineering as a study course in college this fall, I wish to ask you what is generally accepted as the field of mechanical engineering, also the same as regards hydro-electric engineering. A. Mechanical engineering includes the design, building and operating of machinery whether driven by water, steam or other motive power. It includes the study of engines and fuels of all sorts, the strength and properties of materials used in construction, and the designing of machines. A hydro-electric engineer is an electrical engineer engaged in the development of water-power for the generation electricity. An electrical engineer is a mechanical engineer who is trained also in electrical engineering.

(12687) H. K. M. asks: 1. A writer in your paper stated that cyclones always turned clockwise in the northern hemisphere and the reverse in the southern hemisphere. Is that true? And if so, why is it so? A. A cyclone rotates counter-clockwise in the northern hemisphere and clockwise in the southern hemisphere. If the reverse statement appeared, as you say it did, in our columns at any time, we were lacking in vigilance in reading the proof. The reason is that the rotation of the earth upon its axis is more rapid toward the equator and less rapid toward the poles. In a cyclone the wind is blowing with the general currents of the atmosphere, north and south. For an instance take the air, which is moving from north to south in the northern hemisphere. As it moves to the south it comes to a region which is moving by the earth's rotation more rapidly toward the east than the place from which it has come and whose velocity it still retains. The earth's surface goes more rapidly to the east than this air does. It lags or blows toward the west. The reverse takes place with wind blowing from the south to the north in the northern hemisphere. In this way a whirling motion of the air counter-clockwise is set up and is maintained in all whirling bodies of air. The same reasoning will show how the storms in the southern hemisphere rotate clockwise. 2. In a recent issue of your paper there was an article describing the Sperry gyroscopic compass. The writer stated that the force that caused the compass to seek the poles was the revolution of the earth on its axis. How does the revolution of the earth cause the gyroscope to act as it does? A. The explanation of a gyroscope as a compass is based upon somewhat similar reasoning, although not so simple. It is a precessional effect. We recently published an article upon this subject with 13 illustrations in SUPPLEMENT 1864, price 10 cents. We would refer you to this article, since the matter cannot be treated satisfactorily in a letter.

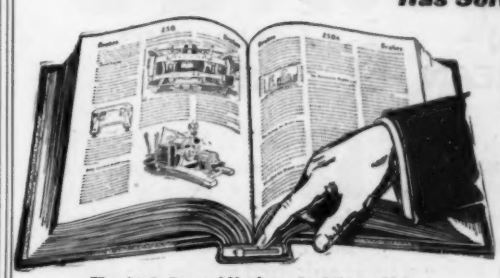
(12688) E. H. asks: Will you kindly tell me where I can procure detailed information concerning ultra-violet rays? How they are produced, and exactly what this light is? A. Ultra-violet rays are always present in the light of the sun, the arc light, the Welsbach mantle lights, and in lesser degree in most white light from other sources. They are the rays of shorter wave length than those which the human retina can receive. They are rendered visible to the human eye by absorbing the longer waves from the light and allowing the ultra-violet waves to strike upon some substance which they can render luminous; that is, some substance in which they can produce longer waves which are able to affect the human retina. These waves possess all the qualities of ordinary light. They differ physically only in wave length from the waves which can affect the retina. The ultra-violet rays affect the photographic plate and produce the action which is called "taking a photograph." Many substances can be used to detect ultra-violet waves. Into a dark room introduce a beam of sunlight or electric light through an opening in which a screen of deep violet glass has been placed. Such a screen had better be bought from dealers in physical apparatus. The ultra-violet rays will pass readily through this screen and will traverse the room in the same path as the white light. Now hold in the path of the ultra-violet light a tumbler of kerosene oil; it will glow with a deep blue light. Many substances may be used with beautiful effects. Vaseline shines with deep yellowish green, a solution of quinine with deep blue. Many materials can be obtained from the dealers in apparatus for these beautiful experiments. The effects are often quite surprising. Write or draw upon white paper with the solution of quinine. When the paper is dry the marks will be almost invisible. In the ultra-violet light they stand out with startling distinctness. We can send you fifteen SCIENTIFIC AMERICAN SUPPLEMENTS at 10 cents each, containing articles upon ultra-violet light. Any good text-book of physics will discuss the theory. We recommend Carhart's "College Physics," price $2.50. These effects will be found described under the title Fluorescence.

Encyclopædia Making is Now at an End!

For twenty years Encyclopædia publishers have been trying to produce a Loose-Leaf Encyclopædia—knowing this to be the only way to keep an Encyclopædia always up to date and have a work that would NEVER GROW OLD. The great difficulty has been to invent a Loose-Leaf binder that would be appropriate for a library volume.

NELSON'S
Perpetual Loose-Leaf
ENCYCLOPÆDIA
& Research Bureau for Special Information

Has Solved the Problem!



That Little Bar and Nut has solved the problem. It has put all other Encyclopaedias out of date!

Bound in 12 Handsome Volumes

In 1907, Thomas Nelson & Sons—established for over a hundred years in Edinburgh, Scotland—perfected and patented a Loose-Leaf Binder, a volume so practicable that by simply turning a nut the pages are loosened, when the old and obsolete pages can be easily removed and the new pages substituted. The publishers issue to subscribers, twice a year, not less than 250 revised pages—in March and in October—thereby making Nelson's Encyclopædia *always new* and abreast of the times. By means of the Loose-Leaf binding device, Nelson's Encyclopædia contains the very latest information, while the other Encyclopædias quickly grow old.

NELSON'S IS THE ONLY AUTHENTIC AND RELIABLE ENCYCLOPÆDIA because it is the only one that is new and can be kept new.

NELSON'S RESEARCH BUREAU supplies—FREE—any special information required by owners of Nelson's Encyclopædia—the ONLY institution of its kind in the world!

With NELSON'S LOOSE-LEAF ENCYCLOPÆDIA and the services of NELSON'S RESEARCH BUREAU FOR SPECIAL INFORMATION you have at your command—positively guaranteed to you—all the available information and knowledge of the world.

Upwards of a million dollars have been spent and more than 1,200 specialists in all parts of the world engaged to make Nelson's the supreme authority for those who know or who want to know. Nelson's has been approved and adopted as an authority by U. S. Government Departments, Universities, Colleges, Libraries and School Boards throughout the country.

NELSON'S contains a complete account of the Parcels Post Law, Dictograph, British National Insurance Law, Olympic Games, Boss Rule, etc., etc.

If You Buy NELSON'S You will never Need to Buy Another

Following are among the U. S. Departments and Colleges now using Nelson's:

Bureau of Chemistry	War Department	University of California	Reclamation Service
Department of Justice	Indian Bureau	University of Michigan	Chief Signal Office
Commerce and Labor	Bureau of Corporations	Weather Bureau	Harvard University
Department of State	National Museum Library	Navy Department	Knox College
Cornell University	University of Rochester	Army Service School	Public Libraries

NELSON'S ENCYCLOPÆDIA is endorsed by newspapers, magazines, scholars and literary workers in all parts of the world. Following are a few examples of thousands on file:

J. G. Schurman, President of Cornell University, says: I have made constant use of my set of your Encyclopædia and find it pre-eminently satisfactory."

The Review of Reviews says: "Nelson's is used as the authority in our Editorial Rooms."

The New York Evening Post says: "All in all, the treatment of the subject matter in Nelson's is an admirable example of compression, and fulfils to an unusual degree the purpose of the editors."

The New York Times says: "Nelson's never grows old, is never antiquated. It will give answer years after its publication to the most modern of queries."

The New York Independent says: "It is safe to say that the owners of Nelson's are the only ones whose Encyclopædia contains accounts of recent events. We find it indispensable."

Dep. 21E

Figure I desire on any Encyclopædia, please send me portfolio containing sample pages and full information in regard to NELSON'S LOOSE LEAF PERPETUAL ENCYCLOPÆDIA AND RESEARCH BUREAU FOR SPECIAL INFORMATION. *This incurs no obligation whatever on my part.*

Name.....
Address.....
City..... *State*.....

EXCHANGE A liberal allowance will be made on old Encyclopædias to apply as part payment on Nelson's.

THOMAS NELSON & SONS
Published Since 1798
Dept. 21K, Fourth Ave. Building, Cor. 27th St., New York City

TELESCOPES
W. & D. MOGEY
PLAINFIELD, N. J.

LEARN TELEGRAPHY

MORSE and WIRELESS at home with OMNIGRAPH AUTOMATIC TEACHER in half usual time—trifling cost. Sends you messages without limit automatically—really become expert. Price $5.00. Catalog free. OMNIGRAPH MFG. CO. Dept. 16. 39 Cortlandt Street, New York.

Learn to Stuff Birds and Animals. A delightful art, easily learned at home. Big Profits. Save your trophies. Decorate your home. We teach men, women, boys by mail. Write for Free Book today. N. W. School of Taxidermy, 4067 Elwood Bldg., Omaha, Neb.

Magical Apparatus
Grand Book Catalog. Over 700 engravings 25c. Parlor Tricks Catalog Free.
MARTINKA & CO., Manufacturers, 493 Sixth Avenue, New York

$13,400.31 on the Side

Mr. F. H. Dunlap of West Salisbury, N. H., in the past twenty-five years has cleared $13,400.31 from hens. This is a remarkable record, when it is known that Mr. Dunlap is employed ten hours a day in a store and all the time he has to put in with his hens is what he can get morning, noon and night. This $13,400.31 was all made on the side. Nor does Mr. Dunlap get fancy prices for what he has to sell. He ships to Boston, and takes current quotations from the commission men there. Mr. Dunlap began in 1887 with twenty hens. In 1910 his poultry profits figured out $1,188.05—and this is all on the side. Mr. Dunlap's hens have bought him a beautiful home, purchased a horse and carriage, sent three boys to school and college, besides saving something for a rainy day. Can others do equally well? "Sure thing," says Mr. Dunlap, "if they will wear out the soles of their shoes, faster than they do the seat of of their chair." The story of Mr. Dunlap's success and his methods is told in the book, "Side-Line Poultry Keeping," and it is only one out of a score of things to set the blood tingling and make one resolve to get next to the $600,000,000 spent in the United States each year for poultry and eggs.

$1,009.31 R. A. Richardson of Haverhill, Mass., a shoe cutter, made his hens pay him $1,009.31 in 1910, and kept working at the bench at the same time. How he did it is told in "Side-Line Poultry Keeping."

"SIDE-LINE POULTRY KEEPING"

is the name of a new book by the author of "200 Eggs a Year Per Hen," the most popular poultry book ever printed. "Side-Line Poultry Keeping" deals with the business side of poultry keeping as the other dealt with egg production. It tells how to make poultry keeping pay. It describes the methods by which F. H. Dunlap of West Salisbury, N. H., makes over $1000 a year from eggs, devoting not over two hours a day to his hens. Not a detail left out. The book tells how to make a start, what breeds pay, how, when and where to buy a farm, how to make a living from the first, describes the most wonderful brooding system in the world, tells how to build the most economical poultry houses and trap nests, how to feed for best results, describes a feed that can be made for 15 cents a bushel and is without a peer for producing eggs, how to make money with pigeons, ducks and market gardening, how to buy and sell to advantage, how to pick out the laying hens, how to put down eggs so that they will keep a year, etc.

Invaluable to every man who wishes to make money on the side, and indispensable to the man who is looking forward to the free, independent, healthful life of the poultry farm. Ninety-six pages; illustrated. Price 50 Cents, or with the American Poultry Advocate one year 75 cents, two years' subscription and book for $1.00, or given as a premium for two yearly subscriptions at 50 cents each. Our paper is handsomely illustrated, 64 to 124 pages, 50 cents per year. 3 months' trial, 10 cents. Sample free. Catalogue of poultry books free.

American Poultry Advocate, 226 Hodgkins Block, Syracuse, N. Y.

Two Aids to Good Appearance

COLGATE'S

RIBBON DENTAL CREAM & SHAVING STICK

GOOD, clean, sound teeth are necessary to good looks and to good health. To keep your teeth in condition, you should clean them twice a day with the efficient dentifrice—Colgate's Ribbon Dental Cream.

Colgate's is thorough in its cleansing, without harmful "grit"—so delicious in flavor that cleaning the teeth is a real pleasure. Its antiseptic action leaves the mouth in a wholesome, non-acid condition.

YOUR face will be smoother and feel better after a quick, clean shave with Colgate's Shaving Stick. The beard is softened while the lather is worked up with the brush—no mussy rubbing-in with the fingers necessary.

The lather is rich, creamy and lasting—the most wiry beard yields quickly and easily. The face feels refreshed after the shave because the lather is notably free from uncombined alkali—softening, soothing, sanitary.

You may have a trial size of both of these comforts by sending us 6 cents in stamps.

COLGATE & CO., Dept. 70, 199 Fulton Street, New York City

Makers of Cashmere Bouquet Toilet Soap—luxurious, lasting, refined

The White Berline Limousine

The Latest Production of the Most Progressive Motor Car Company of America

THE White Berline marks the highest development of the modern motor car, both in beauty of body design, and merit of chassis construction. Every small detail which adds to comfort, convenience, and safety of operation has been carefully and successfully executed.

The logical combination of left-side drive with right-hand control, places the driver in the proper position to handle the car with the greatest amount of safety in traffic, a very important factor in closed cars. The left-side position of the steering wheel, together with the White Electrical Starting and Lighting System, makes it possible to reach the driving seat, start, and light the car without the necessity of stepping into the street. When the services of the chauffeur are not required, the glass partition back of the driving seat can be instantly dropped out of sight, throwing the entire interior into one compartment.

White Berline Limousines are built in Forty and Sixty horse-power models.

The White Company
CLEVELAND

Manufacturers of Gasoline Motor Cars, Trucks and Taxicabs.

YOU, the car owner, need no longer number cylinder troubles among your motor cares.

Pitted cylinder walls and valves, weak compression, faulty ignition, can almost invariably be traced to an inferior cylinder oil.

The perfect cylinder oil contains no carbon impurities. Its lubricating qualities have not been impaired in order to eliminate carbon. It shows a zero cold test.

Texaco Motor Oil meets these requirements. The most careful working tests have shown none of the troublesome carbon deposits so common with motor oils. It burns absolutely clean. It has sufficient body to lubricate perfectly. Cylinders never "dry out," never become scarred or pitted. It has a cold test of zero and thereby eliminates all of the lubrication troubles usually caused by cold weather.

These are strong statements. You may feel skeptical. The best proof of their truth is in the use of the oil itself. Try a can.

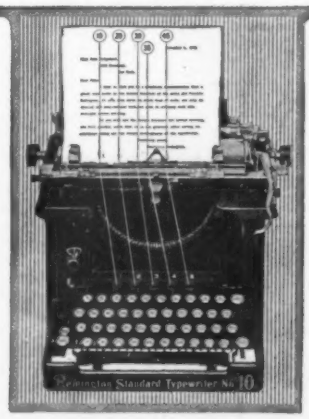
Sold in 1 and 5 gallon cans at garages and supply shops. For instructive booklet, "About Motor Lubrication," address Dept. B, 6 Washington St., New York City.

THE TEXAS COMPANY
HOUSTON NEW YORK

BRANCH OFFICES

Boston Chicago Norfolk New Orleans Dallas Pueblo
Philadelphia St. Louis Atlanta El Paso Tulsa

An Improvement That Pays for the Machine



The above is an accurate statement of the service rendered by the Column Selector of the Model 10

Remington Typewriter

On the Model 10 Remington the starting point of every line of the letter is reached by one touch on a Column Selector Key. The time saved by eliminating hand adjustments of the carriage averages *40 seconds* per letter and envelope. This average has been determined by numerous comparative tests.

Forty seconds per letter! Multiply that by the number of letters your operator writes—every day and every week. Figure this time on the basis of the wages you pay your operator. Then you will see how quickly this improvement pays for the machine.

Remington Typewriter Company
(Incorporated)
New York and Everywhere

JUST PUBLISHED

It contains *608 pages* and *1000 illustrations*, is substantially bound in cloth and the cover carries a special design printed in three colors

SCIENTIFIC AMERICAN REFERENCE BOOK

EDITION OF 1913

ALBERT A. HOPKINS
Compiler and Editor for **Part I. Statistical Information**
Editor of Cyclopedia of Formulas, Handbook of Travel, Etc.
Member of the American Statistical Association

A. RUSSELL BOND
Compiler and Editor for **Part II. Scientific Information**
Editor of Handyman's Workshop and Laboratory

The editorial staff of the SCIENTIFIC AMERICAN receives annually over fifteen thousand inquiries, covering a wide range of topics—no field of human achievement or natural phenomena is neglected. The information sought for in many cases cannot be readily found in text books or works of reference. In order to supply this knowledge in concrete and usable form, two of the Editors of the SCIENTIFIC AMERICAN have, with the assistance of trained statisticians, produced a *remarkable Reference Book*, containing over seventy-five thousand facts, and illustrated by one thousand engravings, for which the entire world has been scoured. Immense masses of government material have been digested with painstaking care with the collaboration of government officials of the highest rank, including cabinet officers, and assisted by competent professors of world-wide reputation.

The average business man would like to know the wireless rate for passing ships, how to compute his interest, or figure his discounts without trouble. The inventor wishes to know something of the patent laws and the fundamental principles which underlie them, as well as to have access to innumerable mechanical movements which will simplify his problem. Most people are curious about the weather, but how many can name the various clouds? We are all interested in the "Navy," but how few know the internal workings behind the walls of steel? Those who are planning a trip will find ocean rates and names of steamers, whether they are to go by the Atlantic, Pacific, or to Southern ports. Aviation, that wonderful and deadly new science, is here fully treated in a chapter, written by a world authority. Under railroads, we find such precise information as the pay of a Pullman porter, the average trip or price of fare, or the lantern signals of the conductor. The Panama Canal is described with the aid of interesting graphical comparisons. Competing high buildings are shown in scale.

There are hundreds of other special features, such as full information as to the new "Parcels Post," with a "zone map," making the rates clear, ocean disasters, ocean records, the chief fires in history, and the medals of honor of our Army and Navy. Owing to the printing of an edition of 10,000 copies, we are enabled to offer this book at a merely nominal price. The purchase of the book is the *only adequate way* to judge of its merits. An elaborate circular, showing specimens of illustrations, together with four full size sample pages, will be sent on request. The following table of contents is very much abbreviated, but still gives an excellent idea of the scope of the book, which must be seen to be appreciated.

PART I.
STATISTICAL INFORMATION

CHAPTER I.
POPULATION AND SOCIAL STATISTICS.
Population of the U. S.
Area and Material Industries.
Sex, Race and Nativity.
Urban and Rural Population.
Occupations.
Marriages, Divorces, Deaths.
Immigrants.
Occupations of Aliens.
Religions.
Pensions.
Education.

CHAPTER II.
FARMS, FOODS AND FORESTS.
Farms.
Wealth Production.
Crops of the United States.
Farm Animals.
Orchard Products.
Fisheries.
The Cost of Living.
Functions of Food.
Lumber and Timber Statistics.

CHAPTER III.
MINES AND QUARRIES.
Mineral Products.
Imports and Exports.
Production of Iron, etc.
Gold and Silver.
Coal Production.
Coal Mine Accidents.
Petroleum.
Clay Products.
Precious Stones.

CHAPTER IV.
MANUFACTURES.
Manufactures in U. S.
Occupations.
Engines and Power.
Food Products.
Textiles.
Iron and Steel.
Transportation.
Clay and Stone.
Leather Industry.
Paper and Pulp.
Chemicals.
Electrical Industry.
Minor Industries.

CHAPTER V.
COMMERCE.
Commercial Statistics.
Exports and Imports.
Principal Ports.
Gold and Silver.
Failures in the United States.
Insurance.
Conflagrations of the World.
Currency of Countries.
Monetary Systems.
Interest Tables.

CHAPTER VI.
MERCHANT MARINE.
Merchant Marine of the U. S.
Mercantile Fleets.
Lowest Ocean Rates.
Transatlantic Steamship Lines
Rates from Canada.
Rates from Pacific Ports.
Rates to West Indies.
Steamship Records.
Marine Disasters.
Rigs of Vessels.

CHAPTER VII.
RAILROADS.
Railways of the World.
Railway Progress.
Railway Mileage.
Revenues and Expenses
Railroad Speeds.
Railroad Accidents.
Express Companies.
Pullman Company.
Street Railways.
Railways of Canada.

CHAPTER VIII.
THE PANAMA CANAL.
The Gatun Dam.
The Locks.
Excavation.
Slides.
Breakwaters.
Panama Railroad.
Canal Statistics.
Distances from New York.

CHAPTER IX.
TELEGRAPHS AND CABLES.
Preparation of Messages.
Land Lines.
Telegraph Rates.
Night and Day Letters.
Submarine Cables.
Cable Messages.

CHAPTER X.
WIRELESS TELEGRAPHY.
Wireless Telegraphy.
Wireless Maps.
Wireless Stations.
Wireless Rates.
Wireless Stations of the U. S.
Wireless Stations of Canada.

CHAPTER XI.
TELEPHONE STATISTICS OF THE WORLD.
Telephone Development.
Telephone Conversations.
Telephone Investment.
Wire Mileage.
Earnings, Telephone and Telegraph.
Traffic: Mail, Telegraph and Telephone.

CHAPTER XII.
POST OFFICE AFFAIRS.
Postal Service of the World.
Rural Delivery.
Domestic Mail Matter.
Rates of Postage.
Money Order System.
Registered Mail.
Rates of Postage, Foreign
Parcels Post.

CHAPTER XIII.
PATENTS, TRADE-MARKS AND COPYRIGHTS.
Information Regarding Patents.
U. S. Patent System.
Court Decisions.
American Inventors.
Patent Laws.
Trade-Marks.
Prints and Labels.
Copyrights.

CHAPTER XIV.
ARMIES OF THE WORLD.
Armies of the World.
United States Army:
Regular Army and Militia
Organization of the U. S. Army.

CHAPTER XV.
NAVIES OF THE WORLD.
Sea Strength of Navies.
War Ship Tonnage.
Ships Data, U. S. Vessels.
Naval Ordnance.
Ships of the U. S. Navy.
Ships Under Construction.
Marine Corps.
Naval Academy.
Submarine Disasters.

CHAPTER XVI.
AVIATION.
Evolution of Air Craft.
Growth of Passive Balloons.
Growth of Power Balloons.
Growth of Passive Fliers.
Growth of Power Fliers.
American Flying Records.
World's Flying Records.
Duration Records.

PART II.
SCIENTIFIC INFORMATION

CHAPTER I.
CHEMISTRY.
Atomic Weights.
Principal Elements.
Melting and Boiling Points.
Chemical Substances.
Heat of Combustion.
Table of Temperatures.
Table of Specific Gravity.

CHAPTER II.
ASTRONOMY AND TIME.
The Earth.
The Moon.
The Sun.
The Solar System.
Names of Stars.
The Northern Heavens.
Night Skies.
The Southern Heavens.
Time.
Calendar for 200 Years.

CHAPTER III.
METEOROLOGY.
Pressure and Height of Atmosphere.
Meteorological Elements and Instruments.
Distribution of Temperature.
Atmospheric Electricity.
Weather Signals.
Clouds.
Mean Temperature.
Lowest, Highest and Normal Temperature.
Normal Monthly and Annual Precipitation.

CHAPTER IV.
MACHINE ELEMENTS AND MECHANICAL MOVEMENTS.
Levers and Pulleys.
Inclined Plane.
Gears, Clutches, Couplings.
Ratchet Movements.
Cams.
Governors.
Springs.
Escapements.

CHAPTER V.
GEOMETRICAL CONSTRUCTIONS.
Geometrical Figures.
Lines and Angles.
Tangents.
Pentagons, Heptagons, Hyperbolas, Parabolas, Ellipses, Cycloids, etc.
Formulas for the Circle.

CHAPTER VI.
WEIGHTS AND MEASURES.
Weights and Measures.
Time.
Decimal System.
Weights of Bushel.
Temperature.
Resistance Table.
Linear Expansion.
Area of Circles.
Value of United States Coins
National Holidays.

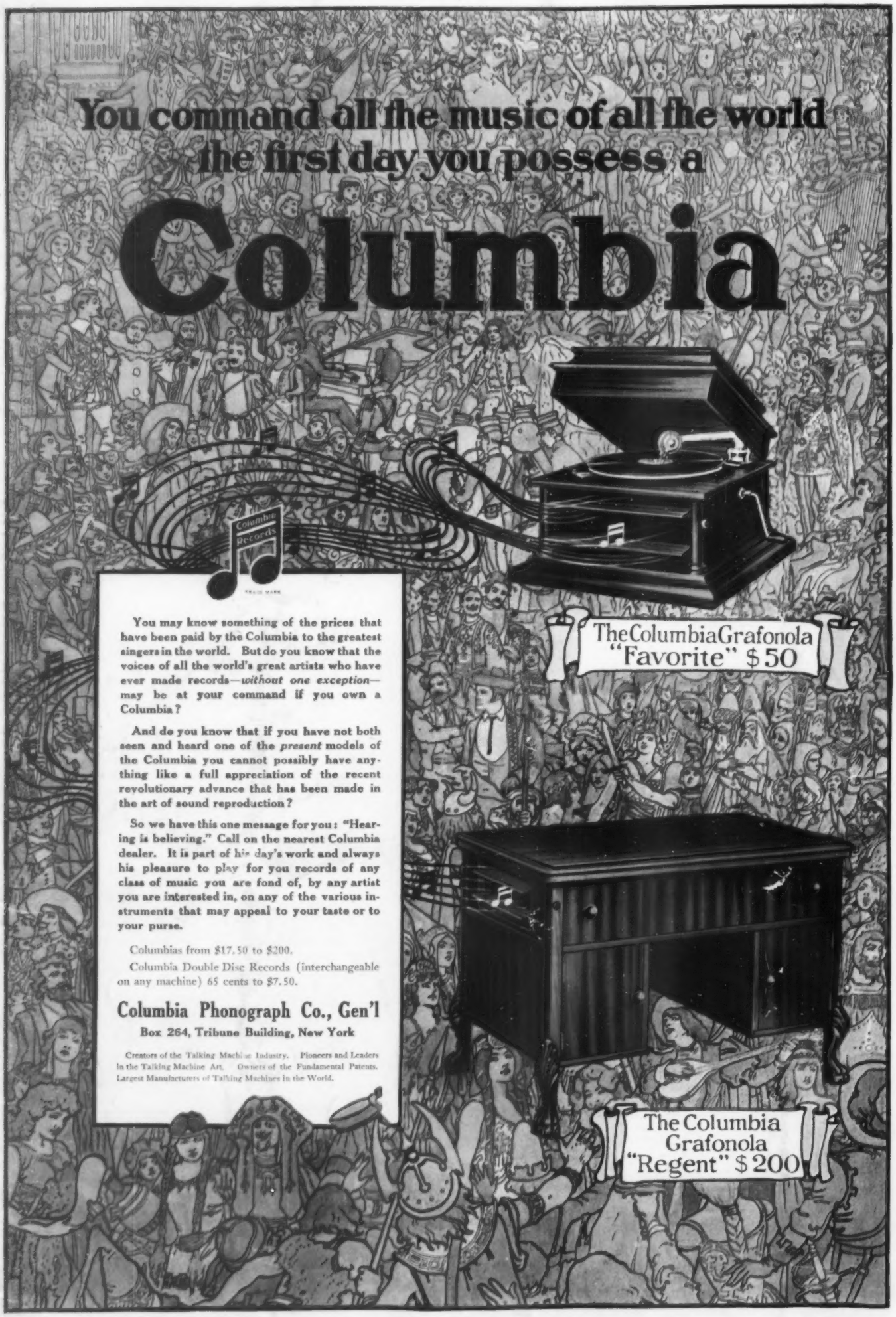
Net Price $1.50 Postpaid

Send for large prospectus and specimen pages

MUNN & COMPANY, Inc., Publishers, 361 BROADWAY, NEW YORK CITY

You command all the music of all the world the first day you possess a

Columbia



You may know something of the prices that have been paid by the Columbia to the greatest singers in the world. But do you know that the voices of all the world's great artists who have ever made records—*without one exception*—may be at your command if you own a Columbia?

And do you know that if you have not both seen and heard one of the *present* models of the Columbia you cannot possibly have anything like a full appreciation of the recent revolutionary advance that has been made in the art of sound reproduction?

So we have this one message for you: "Hearing is believing." Call on the nearest Columbia dealer. It is part of his day's work and always his pleasure to play for you records of any class of music you are fond of, by any artist you are interested in, on any of the various instruments that may appeal to your taste or to your purse.

Columbias from $17.50 to $200.

Columbia Double Disc Records (interchangeable on any machine) 65 cents to $7.50.

Columbia Phonograph Co., Gen'l

Box 264, Tribune Building, New York

Creators of the Talking Machine Industry. Pioneers and Leaders in the Talking Machine Art. Owners of the Fundamental Patents. Largest Manufacturers of Talking Machines in the World.